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Title:	Routine & Nonredundant Steel Tension Member (NSTM) Inspection Report (Final) Property ID No. 43-0434 - Los Alamos Canyon Bridge
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Routine & Nonredundant Steel Tension Member (NSTM) Inspection Report (Final) 2024

Inspection Dates: June 7-9, 2024

Report Date: September 26, 2024 FINAL

Executive Summary

This report covers the inspection findings for the Routine and Nonredundant Steel Tension Member (NSTM) Inspection of the Los Alamos Canyon Bridge over Omega Rd conducted on June 7-9, 2024. The inspections were completed according to the standards referenced in DOE O 437.1 Bridge and Tunnel Management including the National Bridge Inspection Standards (23 CFR Part 650, dated 12/14/2004) and other Federal Highway Administration (FHWA), New Mexico Department of Transportation (NMDOT), and American Association of State Highway and Transportation Officials (AASHTO) codes and standards.

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Los Alamos NATIONAL LABORATORY

National Nuclear Security Administration

U.S. DEPARTMENT OF ENERGY

Routine & Nonredundant Steel Tension Member (NSTM) Inspection Report (Final)

Property ID No. 43-0434 - Los Alamos Canyon Bridge

DOE FIMS RPUID-86471

NBI Structure No. - 7622

Los Alamos National Laboratory - NNSA

Los Alamos County, NM

Inspection Dates: June 7-9, 2024

Los Alamos Canyon Bridge on NM-501 (Diamond Drive) over Omega and Dulce Roads

Prepared by:

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Phone: (215) 656-6500

Report Date: September 26, 2024 FINAL

Prepared for:

National Nuclear Security Administration

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Certification of Inspection and Review

Statement of Inspection

Inspection of the Los Alamos Canyon Bridge over Omega Road included a Routine Inspection and a Nonredundant Steel Tension Member (NSTM) Inspection. The inspection was completed according to the standards referenced in DOE O 437.1 Bridge and Tunnel Management including the National Bridge Inspection Standards (NBIS) (23 CFR Part 650, dated 12/14/2004) and other Federal Highway Administration (FHWA), New Mexico Department of Transportation (NMDOT), and American Association of State Highway and Transportation Officials (AASHTO) codes and standards. The inspection team met the minimum qualifications of personnel as stated in National Bridge Inspection Standards (NBIS) Section 650.309 as documented in the report and were provided to LANL prior to the inspection.

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Sabah Alsabbagh, P.E.

July 26, 2024

Statement of Review

The quality control (QC) review was performed by a qualified engineer to ensure consistency between the narrative provided in the report and the assigned condition states and ratings. In addition, the QC Reviewer provided general oversight of the field inspection work for purposes of safety and data accuracy. The QC Reviewer meets the qualifications of team leader based on education, training, and experience.

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Nestor Delgado, P.E.

August 9, 2024

Executive Summary

This report covers the inspection findings for the Routine and Nonredundant Steel Tension Member (NSTM) Inspection of the Los Alamos Canyon Bridge conducted on June 7-9, 2024. Also included are the inspection findings collected by a rope access team on the same dates. The inspections were completed according to the standards referenced in DOE O 437.1 Bridge and Tunnel Management including the National Bridge Inspection Standards (23 CFR Part 650, dated 12/14/2004) and other Federal Highway Administration (FHWA), New Mexico Department of Transportation (NMDOT), and American Association of State Highway and Transportation Officials (AASHTO) codes and standards. Condition ratings for the bridge components are summarized below in accordance with the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges.

Element	Previous Condition (2023)	Current Condition (2024)
Deck	Fair (NBI=5)	Satisfactory (NBI=6)
Superstructure	Fair (NBI=5)	Satisfactory (NBI=6)
Substructure	Poor (NBI=4)	Fair (NBI=5)

Based on the 2024 Routine Inspection, the bridge deck is rated in SATISFACTORY condition. The previous inspection classified the deck as FAIR, but this does not accurately reflect the condition of the deck. Sounding of the deck identified several areas with delamination that are concentrated near the expansion joints, in the closure joint of the deck near the bridge centerline, and at the south end of the arch span in the northbound lanes around previously repaired areas. None of the delaminated areas have spalled and are still intact. The stay in place forms do not show any signs of corrosion, indicating that no water leakage is occurring through the deck. The quantity of delamination and overall condition of the deck remain relatively unchanged since the previous inspection. On site maintenance personnel routinely make repairs to the deck, and all areas of delamination were marked using spray paint.

Based on the 2024 inspections (Routine and NSTM), the superstructure is rated in SATISFACTORY condition. The previous inspection classified the superstructure as FAIR, but this does not accurately reflect the condition of the superstructure. Section loss was noted on the outriggers; however, the section loss is located in an area on the beam of zero stress. The outrigger extends out past the stringer it supports. Since the outrigger is a cantilever, stress in the beam starts at the location of the stringer and is at a maximum at the spandrel girder connection. The section loss on the outrigger was noted on the exterior portion past the stringer. No measurable section loss was noted on the outrigger in areas of any stress. Corrosion was noted on the steel arch, especially on the west side, but generally no

measurable section loss was noted. The only measurable section loss on the arch was noted in a few steel angles at the connection of the arch column to the arch and was minor.

In the 2024 Routine Inspection of the arch rib members, areas with corrosion were found on the top flange plate and bottom flange angles. The arch columns to arch rib connections are corroded with pack rust. Corrosion/ pack rust is also present at the corners between the plates of the built-up columns where the paint does not thoroughly cover the steel. The steel protective coating (paint) is in FAIR condition. In general, the protective coating failures and corrosion in the affected locations have not changed since the previous inspection. Areas not accessible by the under-bridge vehicle were reached using rope access methods.

The floor beams including the outriggers and the spandrel girders of the Los Alamos Canyon Bridge are classified as NSTMs. The NBIS requires that NSTM’s be visually inspected within "arm's length" to assure the structural integrity of the bridge. During the 2024 inspection, the inspection team used the under- bridge access unit to reach the NSTMs (see "Inspection Procedures" section). Particular attention was given to the connections of the spandrel girders and floor beams for signs of deterioration, damage, and distortion. The tension areas of the floor beams (including outriggers) and spandrel girders were also checked, particularly for corrosion, section loss, and fatigue cracks.

The substructure is rated in FAIR condition. The 2023 inspection report designated the substructure as being in POOR condition (Condition State 4). This has been adjusted in the 2024 report to FAIR condition due to the fact that the cracks and spalls found at the abutment are not in the load path and do not inhibit the load capacity of the substructure. The full width of the south abutment has numerous defects including cracking, delaminations, spalling, leaching and efflorescence. The main area of deterioration is in the top strut that spans between the columns that support each bearing. Corrosion of the reinforcement is evident from staining on the concrete. However, section loss on the exposed longitudinal reinforcement was minor. Additionally, the anchor bolts at the south abutment are in contact with the bearing device due to transverse movement in the east direction. Most of these bolts are not fully threaded. Crack patterns and bridge seat surface measurements could possibly indicate minor settlement of the north abutment towards the west side of the bridge, but no change is apparent from the previous inspection. A 48”x6” area of undermining also exists at the east backwall of the north abutment.

The piers have numerous minor defects including cracking, delamination, spalling, efflorescence, rust staining, salt build up, and abrasion; however, none of the defects found along the piers pose a risk of failure or reduction in capacity. The cracks have not changed since the previous inspection and are characterized as hairline cracks.

The bridge experiences significant and atypical movement (likely due to temperature) that continues to distress the expansion joints (particularly on the south end). It is recommended that the south and north expansion joints continue to be repaired or replaced as needed due to damage caused by snowplows and bridge deformation. To accommodate the significant thermal

movements experienced by a bridge of this size, the recommended types of joints are finger joints or modular expansion joints, the latter of which is currently being used. To gain a better understanding of the bridge behavior (specifically thermal movement) throughout the year, installation of a network of sensors at the abutment areas and periodic monitoring of the measured deformations is recommended. The bridge deformations collected throughout the year may provide meaningful information regarding the global movement of the bridge that is leading to problems with the expansion joints.

Based on the inspection findings, the repair and maintenance recommendations are summarized below under the corresponding priority level (1- immediately, 2 – within the next 5 years, 3 - when resources allow):

Priority 1:

- Round and turn down the north and south ends of the steel bridge rails.

Priority 2:

- Install erosion protection in areas surrounding abutments and piers, particularly in areas with undermining.
- Clean and repaint movable bearings at north and south abutments.
- Repair concrete at north and south abutments.
- Repair the deck locations with delaminations and spalls.
- Repair concrete on east and west bridge rail near the south abutment that has cracked and delaminated concrete from collision damage.
- Repair concrete at piers.

Priority 3:

- Reseal joints on gutter located on pedestrian walkway.
- Remove debris around movable bearings at abutments.
- Perform ultrasonic testing of pins at abutment, pier, and arch bearings.
- Repaint superstructure.
- Repair bent steel guardrail east side of south approach.

No critical findings were identified during the 2024 Routine Inspection and NSTM Inspection.

In 2018, a load rating analysis was conducted by Bohannan Huston, Inc. (BHI) based on the Load and Resistance Factor (LRFR) Method resulting in rating factors of 0.35 (inventory) and 0.46 (operating) under HL-93 live loading. In addition, the Los Alamos Canyon Bridge was evaluated for legal loads, special haul vehicles, and emergency vehicles. Results from the 2018 BHI study showed the bridge had sufficient capacity to carry these loads and thus, load posting of the Los Alamos Canyon Bridge is not required. In summary, the structure status (open, no restriction) of the Los Alamos Canyon Bridge is supported by the 2018 BHI study results.

Due to the 2024 inspections re-evaluation of all condition ratings as described above, it is recommended that the inspection cycle be changed from a 12-month to a 24-month. Conduct the next NSTM Inspection and Routine Inspection on the newly established interval (24-month).

RPUID 86471- Routine and NSTM Inspection Report
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Bridge Summary and Description

Bridge Description and Location

The Los Alamos Canyon Bridge (also called the Omega Bridge) is a riveted, steel arch bridge that carries north and south bound traffic on Diamond Drive (NM 501) over the Los Alamos Canyon, as well as over Omega and Dulce Roads, between the town of Los Alamos, New Mexico and technical areas of the Los Alamos National Laboratory (LANL) (see Fig. 1 and General Photos 1-8). Other identifying information for the bridge includes the following: NBI Structure Number= 7622; latitude= 35.88 degrees/ longitude= 106.3219 degrees; Defense Highway= Not a Strategic Highway Network (STRAHNET) highway; Highway System= Not on the National Highway System (NHS); and inventory direction= south- to-north.

The Los Alamos Canyon Bridge was designed by Finney and Turnipseed, fabricated by the American Bridge Company, and erected by the Vinson Construction Company in 1951. In 1992, the floor system of the bridge was rehabilitated. The major rehabilitation work done on the bridge included: light-weight concrete was used for the deck; shear studs were installed on the interior stringers and portions of the spandrel girders to provide composite action with the deck; cover plates were added to the interior stringers and spandrel girders for additional moment capacity; and exterior stringers supported by outrigger beams were added on both sides of the bridge width. Since 2014, significant work completed on the bridge (with the estimated date of completion) includes the following: High Molecular Weight Methacrylate (HMWM) protective coating applied to deck (September 2014); southwest bearing realigned and keeper plate replaced (August 2014); erosion control installed near south skewback column (2014); restriping of roadway and deck (2016); repaving of south approach roadway (2018); restriping of north approach (2020); installation of gutter on west side of pedestrian walkway (2021); replacement of steel bridge rails on west and east sides of bridge deck (2021); repainting of bridge/ pedestrian rails and light poles (2021); retrofit of pedestrian rail with chain link fencing (2021); and repair of deck and approach roadway spalls (2023). In addition, the north and south expansion joints have been replaced frequently due to continued damage caused by snow removal activities. Note that the work described above may not be all inclusive.

As shown in Fig. 2, the bridge is 814.5 ft long from abutment bearing to bearing, with a 442.5 ft arch span and six 62 ft approach spans (there are three approach spans at each end of the bridge). Figure 3 shows the cross section of the bridge after the 1992 rehabilitation, which increased the width of the cross section from 51 ft-3 1/2 in. to 55 ft-6 in. and the roadway from 39 ft-9 in. to 44 ft-0 in. to provide four 11 ft-0 in. wide traffic lanes. The original roadway had no shoulders and three lanes, with 14’ wide outer lanes and a 12’ wide inner lane.

FLOOR SYSTEM and ABUTMENTS

The floor system includes a reinforced concrete slab (with stay-in-place metal forms), six stringers (rolled steel), 28 floor beams (riveted steel), and two spandrel girders (riveted steel); the stringers and spandrel girders are continuous spans supported by the floor beams and columns, respectively. At the north and south ends of the bridge, the spandrel girders are supported by reinforced concrete stub abutments. The slab concrete has a density of Wc = 120 lb/ft^3 and a 28-day compressive strength = 4.5 ksi. The slab thickness is ts = 7.25 in., which includes a 0.5 in. integral wearing surface, and the slab is topped with an HMWM overlay.

Bridge rails consist of reinforced concrete/steel barriers (located on the west and east sides of the roadway), and a pedestrian walkway (i.e., sidewalk) is located on the west side of the bridge.

Bridge appurtenances include a sidewalk railing, west and east guardrails, fencing and light poles, and electric and steam utilities. The fencing is situated only on the 150 ft center portion of the bridge length on each side of the deck.

Each stringer is a continuous beam supported at the locations of the floor beams over a total of 27 spans; there are 12 spans on the approach to the arch (six on both the north and south ends) and 15 spans over the arch. The two exterior stringers are W21x83 sections (ASTM A36 steel) with no cover plates, which were installed during the 1992 retrofit. The four interior stringers are W21x62 sections (ASTM A7 steel), which were installed when the bridge was originally built in 1951.

The floor beams are built-up sections as shown in Fig. 4. The angle thickness is 9/16 in. for the floor beams located at the abutments and the eight floor beams situated at the center of the bridge; the remaining 18 floor beams have an angle thickness of 5/8 in. The span length of the floor beams measured center to center of the spandrel girders is 35 ft.

The spandrel girders are built-up sections as shown in Fig. 5. Each spandrel is a continuous girder supported by the abutments and the columns over a total of 21 spans; there are three approach spans on the north and south end of the bridge and 15 shorter spans over the arch.

COLUMNS, ARCH RIBS and SUBSTRUCTURE UNITS

Each spandrel girder lies in the arch rib plane and is supported by four pier columns, 14 arch columns, and two skewback columns. The pier columns have a riveted connection to the spandrel girder and either a roller or pinned support at the base. The substructure units of the pier columns (8 total) consist of reinforced concrete pedestals and footings. The top ends of the skewback and arch columns also are riveted to the spandrel girder. The bases of the skewback columns are fixed to a concrete foundation, while the bottom ends of the arch

columns are riveted to the arch rib. Similar to the pier columns, the substructure units of the skewback columns (4 total) consist of reinforced concrete pedestals and footings. The cross sections of the pier and arch columns are identical. The pier and arch columns and the skewback columns' cross sections are shown in Fig. 6.

Each arch rib, which was originally built in 1951, is a two-hinge parabolic arch with a span of 422.5 ft and a rise of 106.6 ft as shown in Fig. 2. The steel used for the arch ribs is ASTM A7. The transverse distance between the two arch ribs is equal to 25 ft and the support locations of the east and west arch are at the same elevation. Furthermore, each arch rib is symmetrical about its centerline. The substructure units of the arch ribs (4 total) consist of reinforced concrete pedestals and footings. Fig. 7 shows the cross section of the arch ribs.

NONREDUNDANT STEEL TENSION MEMBERS

The nonredundant steel tension members (NSTMs) of the Los Alamos Canyon Bridge include the spandrel girders and floor beams/outriggers. Tension elements of spandrel girders include steel angles and web plate (below neutral axis) in positive moment regions (between columns) and steel angles, top plate, and web plate (above neutral axis) in negative moment regions (near and above columns). Tension elements of floor beams include steel angles and web plate (below neutral axis) in positive moment regions (between spandrel girders) and steel angles, steel rods (passing through spandrel girders), and web plate (above neutral axis) in negative moment regions (near spandrel girders). For the outriggers, the tension elements include the top flanges (and connections) and web (above neutral axis).

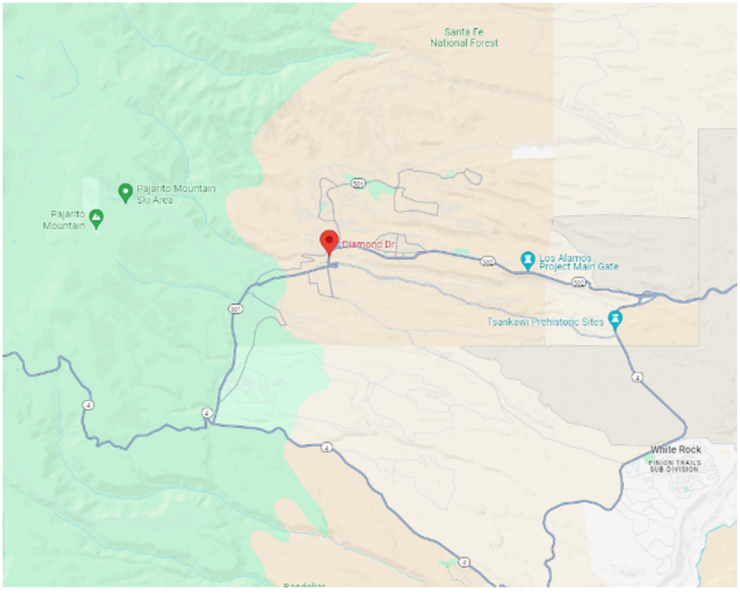


Figure 1- Bridge location on Diamond Drive (NM 501) over Los Alamos Canyon and Omega and Dulce Roads.

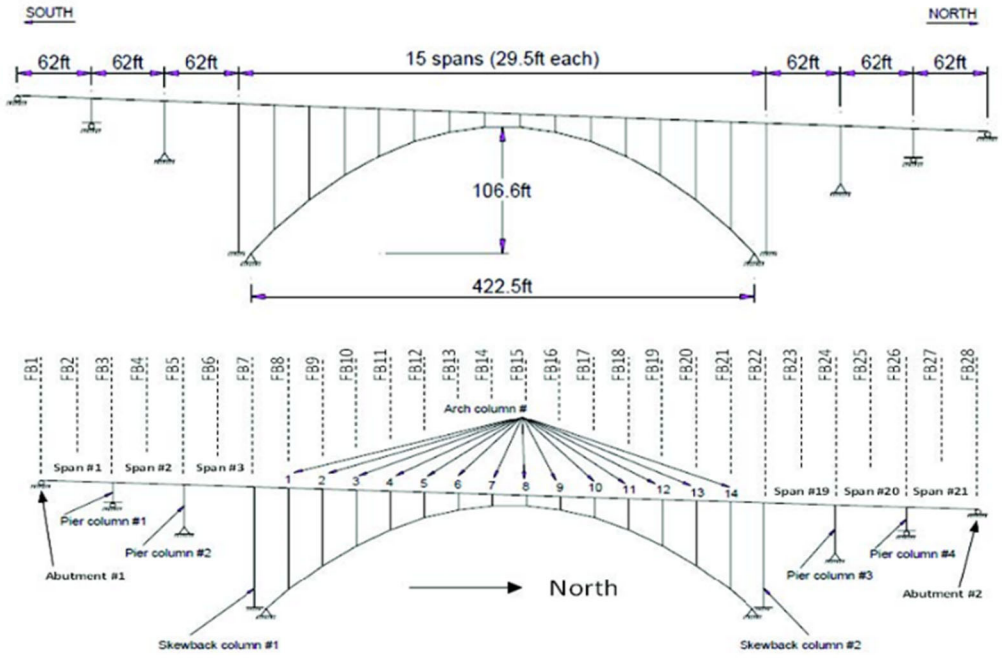


Figure 2- Elevation view of the Los Alamos Canyon Bridge.

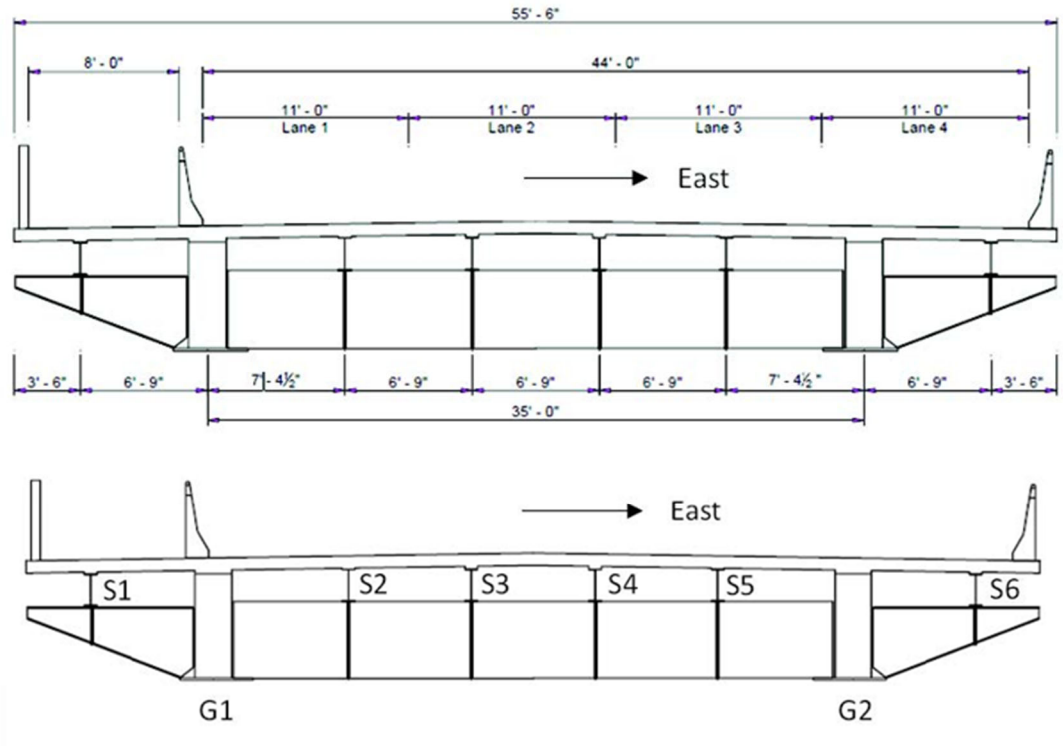


Figure 3- Cross-section of floor system after rehabilitation in 1992.

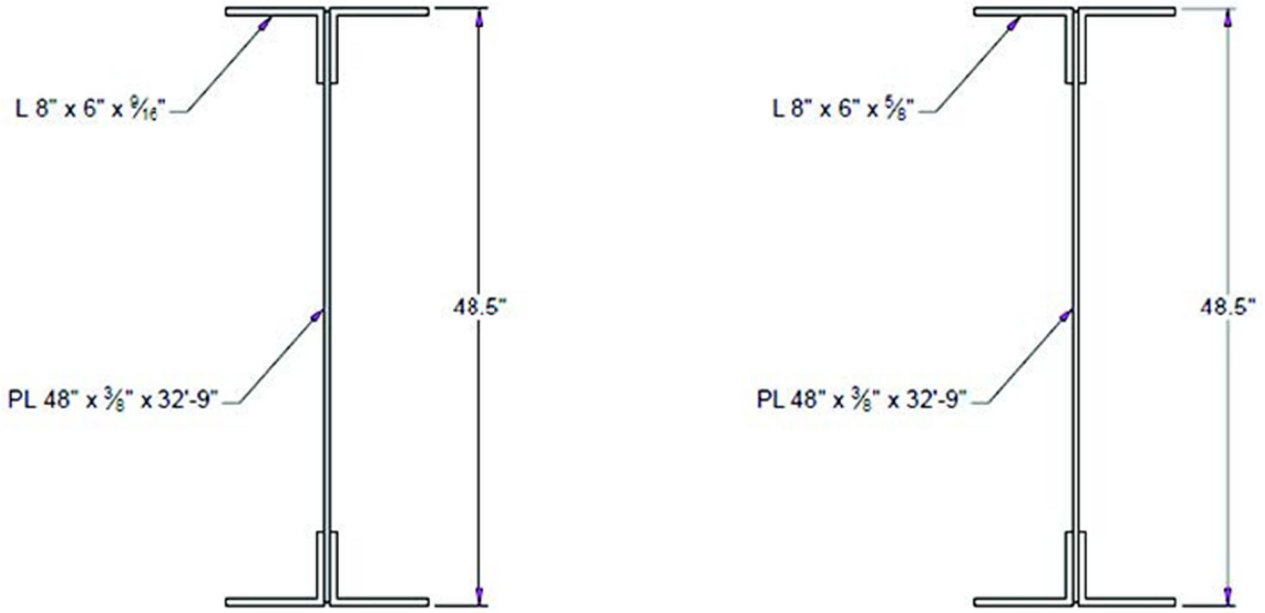


Figure 4- Floor beam sections.

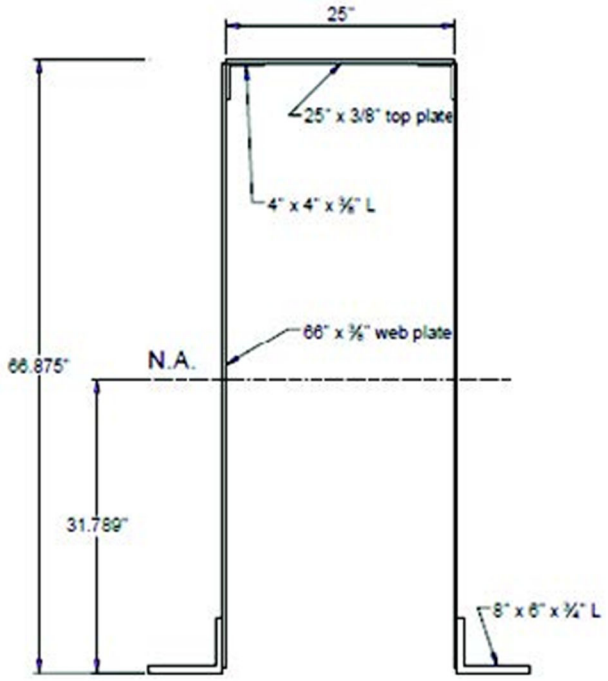


Figure 5- Spandrel girder section.

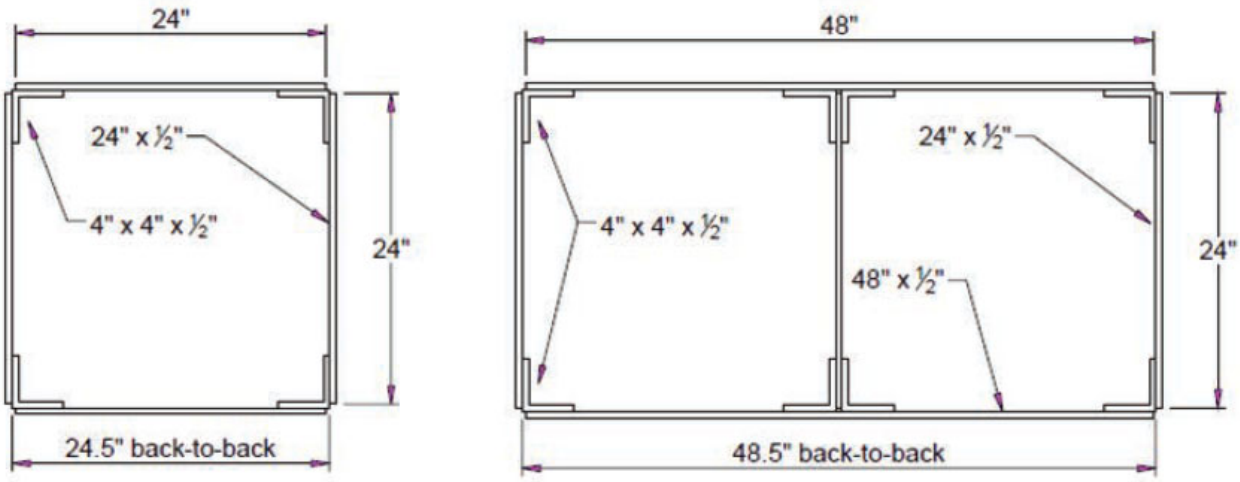


Figure 6- Cross-sections of pier/ arch columns and skewback columns.

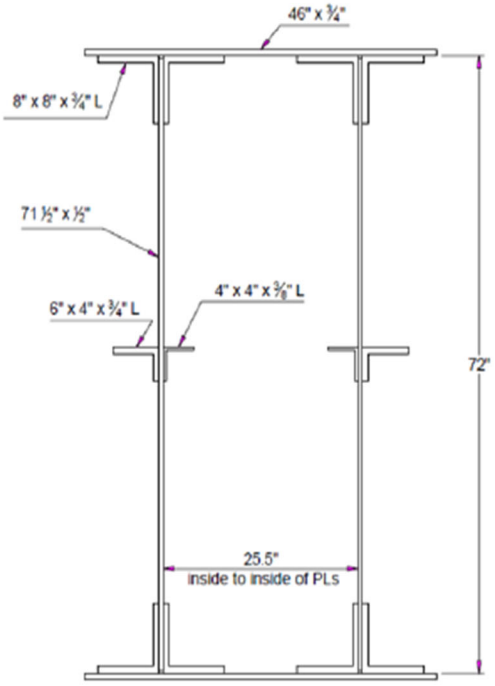


Figure 7- Cross-sections of arch rib.

General Photo 1- North approach looking south.

General Photo 2- Top of bridge from south approach looking north.

General Photo 3- East elevation looking southwest.

General Photo 4- West elevation looking east.

General Photo 5- General view of underside of bridge.

General Photo 6 – Use of under-bridge vehicle for inspection.

General Photo 7 – Traffic control on Bridge.

General Photo 8 – Use of rope access for inspection.

Orientation

The bridge has 21 spans (including 6 approach spans and 15 spans above the arch) numbered 1 to 21 from south to north. The abutments, pier columns, skewback columns, and arch columns are also numbered from south to north (i.e., abutment #1 and #2, pier columns #1 through #4, skewback columns #1 and #2, and arch columns #1 through #14). The substructure units for the pier and skewback columns are numbered in accordance with the supported column. The substructure units of the arch rib are numbered #1 and #2 on the south and north ends, respectively. The floorbeams are numbered 1 to 28 starting from the south abutment. The numbering and orientation of the bridge elements are shown in Figures 2 and 3.

Inspection Summary

Scope of Inspection

The scope of work for the Los Alamos Canyon Bridge inspection included the following: (1) Routine Inspection and (2) NSTM Inspection. The inspection standards followed were DOE O 437.1, the National Bridge Inspection Standards (23 CFR Part 650, dated 12/14/2004) and other FHWA, NMDOT, and AASHTO codes and standards. The bridge was inspected by the U.S Army Corps of Engineers Philadelphia District (USACE Philadelphia). Inspection dates and the associated inspection work are summarized below:

Table 1. Inspection dates and work completed.

Day	Description of Inspection Work
06/07/24	Inspection of pedestrian walkway, pedestrian guardrail, parapet, and abutments. Pier columns and pier footings that were accessible by foot were also inspected along with the abutments (pier column 1 and 4, east and west).
06/08/24	Rope Access team inspected the following: arch columns 1-3 and 12-14, skewback columns 1 & 2, on east side; east side of arch and bracing from arch abutments to column 3 on the south side, and from arch abutment to column 12 on north side; cross bracing between skew back columns. The snooper team inspected the following: the entire east spandrel girder, all floorbeams and stringers, east outriggers, east arch and bracing from arch column 3 to 12, and east arch columns 4-11. The snooper team also inspected the northbound lanes of the deck and east railing while the lanes were closed.
06/09/24	Rope Access team inspected the following: arch columns 1-3 and 12-14, skewback columns 1 & 2, on west side; west side of arch from arch abutments to column 3 on south side, and from arch abutment to column 12 on north side. The snooper team inspected the following: the entire west spandrel girder, west outriggers, west arch and bracing from arch column 3 to 12, and west arch columns 4-11. The snooper team also inspected the southbound lanes of the deck and west railing while the lanes were closed.

Inspection Conditions

Inspection conditions for the on-site field work are summarized below:

Day	Start Time	End Time	Temp Range	Cloud Cover	Humidity	Wind
06/07/24	10:00 am	4:00 pm	72-96°F	Sunny	~ 35%	~ 9 mph
06/08/24	7:00 am	4:00 pm	78-96°F	Sunny	~ 15%	~ 10 mph
06/09/24	7:00 am	1:00 pm	68-85°F	Sunny	~ 25%	~ 7 mph

Inspection Team

The Team Leader in charge of any NSTM inspection must meet qualifications of a team leader for normal bridge inspections and have completed an FHWA approved training course on the inspection of NSTM. The NSTM team leader, Sabah Alsabbagh, meets these requirements. Mr. Alsabbagh is a registered professional engineer, has 8 years of bridge inspection experience, completed a comprehensive bridge inspection training course as well as refresher training every 5 years, and has completed an FHWA approved NSTM inspection training. Personnel inspecting NSTMs will be working under the supervision of the team leader in charge of the NSTM inspection. The qualifications of other team members are:

- Matt Sosna, PE, 15 years of bridge inspection experience, completed a comprehensive bridge inspection training course as well as refresher training every 5 years, completed two NSTM inspection training courses.
- Carl Leunig, PE, 15 years of bridge inspection experience, completed a comprehensive bridge inspection training course as well as refresher training every 5 years, completed one NSTM inspection training courses. Level 3 SPRAT Rope Access Supervisor.
- Joe Gonglik, PE, 7 years of bridge inspection experience, completed a comprehensive bridge inspection training course as well as refresher training every 5 years, completed an FHWA approved NSTM inspection training course. Team Leader of Rope Access team. Level 1 SPRAT Rope Access inspector.
- Evan Amezquita, 3 years of bridge inspection experience, completed a comprehensive bridge inspection training course, Level 1 SPRAT Rope Access inspector.
- Liam Ryan, 1 year of bridge inspection experience, Level 1 SPRAT Rope Access inspector.

Inspection Procedures

ACCESS:

Unique features of the bridge include the following: (1) 422.5 ft arch spans with 106.6 ft rise from bottom of arch to crown; (2) NSTMs' consisting of the spandrel girders and floor beams, including outriggers; (3) vehicular and pedestrian traffic; and (4) steep/mountainous terrain surrounding bearing locations of pier/ skewback columns and arch rib foundation. In addition, the bridge does not have an integrated form of access such as a catwalk.

The bridge features summarized above necessitate traffic control and various forms of access including an under-bridge access unit, rope access methods, and trekking activities. The under-bridge access unit is used to inspect the primary floor system and secondary lateral bracing elements and connections. An Aspen Aerial A-52 was used for the inspection. USACE Tulsa District provided this resource, as they own this vehicle and have a driver to operate it. An A-52 or larger must be used for the inspection or the basket will not be able to reach over the side of the bridge due to the sidewalk and fencing. Above all, the unit provides the most practical means of access for the hands-on inspection (i.e., within arm's reach) of the NSTMs including the spandrel girders and floor beams (members and connections) as required by the National Bridge Inspection Standards for NSTM Inspections. The unit is also used to inspect the stringers, bottom sides of the deck, and pedestrian walkway (including stay-in-place metal decking). Inspection of the arch ribs and columns is also conducted using the under-bridge access unit, but is limited to locations reachable from the maximum safest extension of the bucket.

Due to the reach limitations of the under-bridge access unit, a hands-on inspection of the arch ribs (including connections to arch columns) was conducted using rope access methods during the 2024 inspection. SPRAT certified climbers with USACE Philadelphia rappelled from the bridge deck and positioned themselves within arm's reach of the arch rib components. Tie off points were provided by attaching the ropes to the axles of SUV vehicles. For more description on rope access methods, refer to the plan submitted to LANL. The rope access team also inspected other outlying areas of the primary components such as the bases of the steel skewback columns and top sides of the supporting concrete pedestals, and secondary members including the portal bracing towers at the ends of the arch and the lateral bracing between the arch ribs (including the end connections). All rope access procedures and safety precautions conformed to the Society of Professional Rope Access Technicians (SPRAT).

Several components of the bridge were accessible from the roadway or ground level including the abutments, bearing devices, column pedestals, deck/ pedestrian walkway (top sides), approach roadways/ guardrails, expansion joints, and bridge/ pedestrian rails. These members

along with others described above were accessed by foot and inspected within arm's reach in accordance with the National Bridge Inspection Standards as part of the Routine Inspection.

TRAFFIC CONTROL:

The inspection of the Los Alamos Canyon Bridge was scheduled on the weekend to minimize traffic disruption during operation of the under-bridge access unit. LANL personnel provided the necessary traffic control during the weekend inspection. Portable signage and devices were designed, approved, and installed by LANL on the bridge approaches and roadway to guide on-coming traffic through the work zone. In addition, an attenuator was positioned behind the under-bridge access unit to protect the unit from direct impact and ensure safety of inspectors. Traffic control was also necessary to safely inspect the topside portions of the bridge including the deck (particularly during sounding of the deck), expansion joints, barrier and guard rails, and approach roadways. In addition, the traffic control was positioned to provide a safe working environment for the rope access team (particularly when descending down from the roadway on the east side of the bridge).

INSPECTION METHODS:

The National Bridge Inspection Standards (NBIS) require highway bridges to be inspected and evaluated by qualified inspectors. The inspection team meets the required NBIS qualifications and inspected the bridge in accordance with the applicable criteria for steel arch bridges. Equipment used for inspecting steel bridges was transported to the work site by the inspection team. Primary bridge components including the deck, superstructure, and substructure received a thorough visual inspection (plus physical inspection) and photographic documentation using digital cameras were collected to support the inspection findings.

The field inspection team used clothing and accessories appropriate for the weather and work conditions encountered at the bridge site including, but not limited to, the following:

- work shirts and long pants
- hard hat for head protection, safety vest for high-visibility, and work boots with steel toe for foot protection
- gloves for hand protection and safety glasses/goggles for eye protection
- full body harness and lanyard for fall protection during use of under-bridge access unit.
- Climbing harness and accessories

In addition to the safety equipment, the field inspection team used standard tools, maintained in good working order, as needed in accordance with the manufacturers' recommendations including, but not limited to, the following:

- cleaning tools - whisk brooms, wire brushes, scrapers, screw drivers, shovels

- inspection tools - tool belts, rock hammers, plumb bobs
- visual aid tools - binoculars, flashlights, magnifying glasses, dye penetrant
- measuring tools - tapes, crack gauge, thermometers, wind gauge, carpenter's level
- documentation tools - inspection forms, field books, digital cameras, laptop computers
- access tools - under-bridge access unit, SPRAT equipment
- miscellaneous equipment - insect repellent, sunscreen, first-aid kit, and cell phones

As mentioned previously, the Scope for the bridge inspection includes a NSTM Inspection of the spandrel girders and floor beams, and a Routine Inspection of all other bridge components. Both inspection types are performed in accordance with the visual / physical inspection procedures described in the AASHTO Manual for Bridge Evaluation and the Bridge Inspection Reference Manual. Nondestructive testing methods are not used for either inspection type.

In general, as part of the Routine Inspection, the concrete components (including the deck, bridge rails, abutments, and column pedestals) are checked for typical defects including spalling, delaminations, exposed rebar, efflorescence/ rusting, and cracking. The deck was sounded with sounding hammers, and the delaminations were marked by USACE Philadelphia. The steel components (including the bridge/ pedestrian rails, arch ribs, columns, bearings, and stringers) were checked for typical defects including corrosion, cracking, connection problems, and distortion / damage. The concrete/ steel protective coatings (if applied), assembly joint seals, and approach roadway/ guardrails were also evaluated. Defect quantities for the National Bridge Elements (NBEs) and Bridge Management Elements (BMEs) are documented according to the AASHTO Manual for Bridge Element Inspection.

Inspection of the bridge deck (underside) and superstructure components requires an under-bridge access unit, mainly for the hands-on inspection of the NSTMs. The under-bridge access unit is operated from the "top side" and "bucket" by qualified inspectors. The procedures employed in the inspection with the under-bridge access unit include, but are not limited to, the following:

- inspectors complete the necessary safety training with respect to falls, falling objects and safety in construction zones as required by LANL
- pre-inspection, on-site meetings are held between the responsible parties (e.g., inspection team, LANL, under-bridge access unit operators)
- inspectors working from under-bridge access unit bucket use a full body harness with lanyard for fall protection (connections have locking snap hooks to tie off to the bucket)
- communication between the inspectors and the under-bridge access unit operators is maintained with two-way radio equipment
- use of the under-bridge access unit is postponed accordingly in times of inclement weather and/or passing of oversized/ overloaded vehicles.

The floor system has 27 bays with a deck - stringer - floor beam - spandrel girder load path. Starting on the south end of the bridge (with traffic control in place), the floor system was inspected from bay to bay from the east side; the bays are numbered in the south-to-north direction (bay #1 spans from FB#1 to FB#2, bay #2 spans from FB#2 to FB#3, etc.). In each bay, the inspectors were positioned within arm's reach of the tension areas of the floor beams/ outriggers and spandrel girders as required for the NSTM Inspection.

Careful attention was given to inspecting these areas for section loss caused by corrosion and/or cracking. After inspection of the entire length of bridge from the east side, the traffic control was repositioned and the inspection continued in the north-to-south direction on the west side of the bridge (starting with bay #27 rather than bay #1). The inspection focuses on the outriggers and spandrel girder located on the west side since the floor beams and east side outriggers and spandrel girder were previously inspected.

As part of the Routine Inspection, the non-NSTMs of the floor system (underside of deck, stay-in-place forms, and stringers) and the other non-NSTMs of the superstructure (columns and arch ribs) were also inspected from the bucket of the under-bridge access unit. In addition, a rope access team performed a hands-on inspection of the arch ribs and other areas not reachable from the under-bridge access unit. The team rappelled down to the skewback and arch columns at the north and south ends of the east arch rib and worked toward the center of the bridge using multiple drops. The process was then repeated for the west arch rib and columns. Close attention was given to evaluating the steel defects and the effectiveness of the steel protective coating applied to the superstructure components.

Hard hats were worn at all times for protection against falling objects and impact with bridge components. Safety vests were used during all inspection activities, including those on and off the roadway (i.e., traffic areas).

All photos in the report were taken during the inspection 6/7/24 to 6/9/24.

INSPECTION FREQUENCIES:

The Proposed inspection frequencies, based on the condition of the bridge and FHWA requirements is provided below:

Inspection Type	Inspection Interval
Routine Inspection	24 months
Nonredundant Steel Tension Member Inspection	24 months
Underwater Inspection	N/A

Special Inspection	N/A

Due to the 2024 inspections re-evaluation of all condition ratings as described in this report, it is recommended that the inspection cycle be changed from a 12-month to a 24-month inspection cycle.

NONREDUNDANT STEEL TENSION MEMBERS:

As mentioned above, NSTMs (i.e., spandrel girders and floor beams including outriggers) were inspected within arm's reach from the bucket of the under-bridge access unit as required by the National Bridge Inspection Standards for a NSTM Inspection. Tension elements of spandrel girders include steel angles and web plate (below neutral axis) in positive moment regions (between columns) and steel angles, top plate, and web plate (above neutral axis) in negative moment regions (near and above columns). Tension elements of floor beams include steel angles and web plate (below neutral axis) in positive moment regions (between spandrel girders) and steel angles, steel rods (passing through spandrel girders), and web plate (above neutral axis) in negative moment regions (near spandrel girders). For the outriggers, the tension elements include the top flanges (and connections) and web (above neutral axis). Figures 8 and 9 delineate the tension elements of the spandrel girders (illustrated for spans #1 through #3) and a typical floor beam.

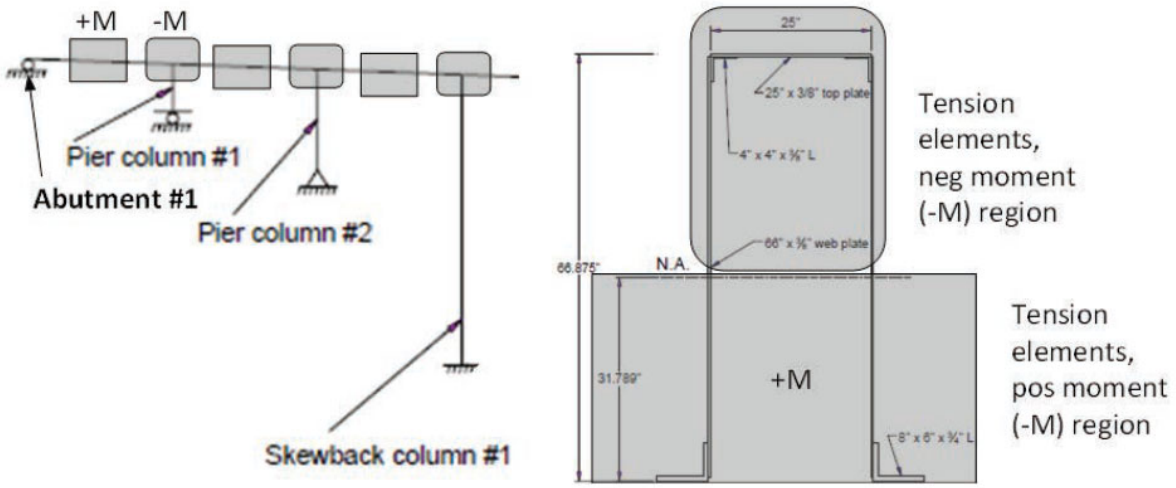


Figure 8- Tension elements of nonredundant steel tension members - spandrel girder (span #1-#3).

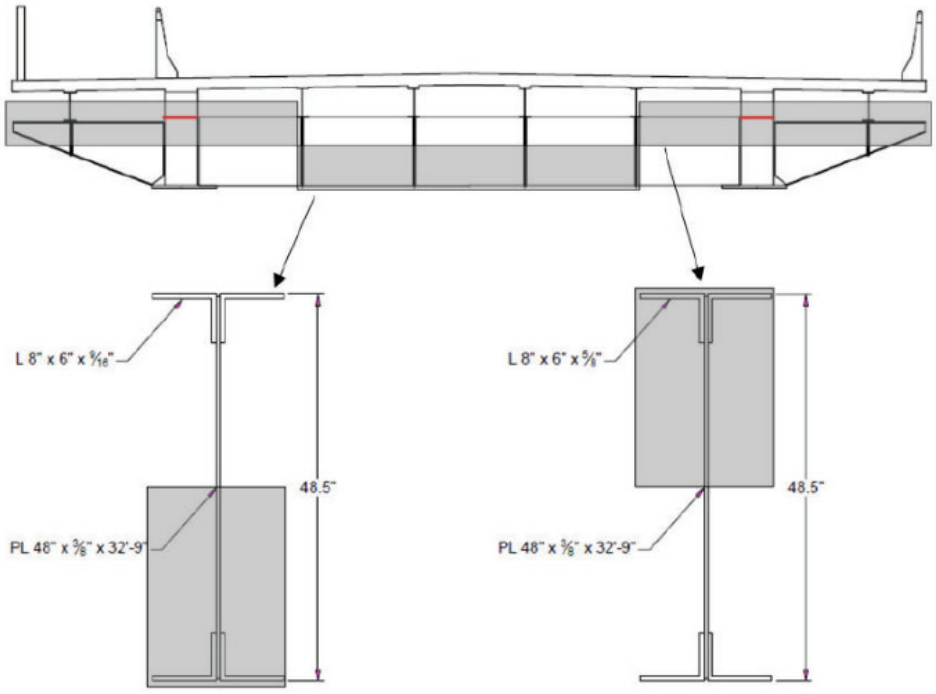


Figure 9- Tension elements of nonredundant steel tension members - floor beam/ outrigger (typical).

COMPLEX BRIDGE FEATURES:

Not applicable.

DECK NBI ITEM 58 CONDITION RATING - SATISFACTORY {6}

DECK CONDITION

Overall, the deck is rated in SATISFACTORY condition. Element level data for the reinforced concrete deck (NBE 12) with concrete protective coating (BME 521) and assembly joint seals (BME 303) on the north and south ends of the bridge are attached at the end of this report. The previous inspection report classified the deck as FAIR, but this does not accurately reflect the condition of the deck.

Sounding of the deck identified several delaminated areas. Most delaminations are concentrated adjacent to the south/ north expansion joints, in the closure joint of the deck near the bridge centerline, and near previously patched areas in the northbound lanes of the south end of the arch span (**Photo 1**). None of the delaminated areas have spalled and are still intact. All areas of delamination were marked using spray paint. The “Deck Delamination Map” provided by LANL for the 2023 inspection is included in this report as Attachment 3. The quantity of delamination remained generally unchanged since the previous inspection.

At the south joint, delaminated areas were found on the adjacent header areas of the bridge deck and approach roadway. Patch repairs at both the north and south expansion joints are adhering but there are cracks and delaminations at both joints **(Photos 2 & 3)**. Additionally, cracking and spalling continues outside of the patches immediately north of the north expansion joint. There is a ¾” vertical displacement in the southern expansion joint at the pedestrian walkway **(Photo 4)**. Installation of new north and south joints was completed in September 2022 (**Photos 3 & 5**).

In the deck closure joint near the bridge centerline, there were several delaminated areas found over the total bridge length; the delaminations usually extend the full width (1-ft., 4- in.) of the closure joint **(Photo 1)**.

The stay-in-place forms do not show any signs of corrosion, indicating no water leakage is occurring through the deck **(Photo 7)**. An area of formwork has a temporary support at FB14 **(Photo 6)**. This was used during construction and is no issue for the deck.

Several minor spalls were found on the western facia, mainly near the pedestrian rail post and light post locations.

The **deck edges** adjacent to the east and west bridge barriers have light map cracking, light

leaching, and several small spalls (**Photo 8**).

The light poles and supports previously had corrosion but were repainted in 2022 **(Photo 9)**. The utility conduit clips under the western deck are heavily corroded due the drainage at the west side of the bridge **(Photo 10)**.

Photo 1- Elevation view of deck, looking north. White outlines indicate locations of deck delaminations.

Photo 2- North expansion joint looking west; small spalls and delaminations (up to 1') along both edges of the deck joint.

Photo 3- South expansion joint looking west. Note small spalls and delaminations (up to 1') at both edges of the deck joint.


Photo 4– ¾" vertical displacement in south expansion joint at pedestrian walkway.

Photo 5– General view of north expansion joint, looking east.

Photo 6– Temporary support at failed stay in place forms at Floorbeam S14.

Photo 7- Minor damage throughout the stay-in-place forms at span 1. Typical up to bay 4.

Photo 8– General photo of east facia. Note rust staining and cracking.

Photo 9- Repainted light pole and support with cracking at light pole foundation.

Photo 10- Utility pipes at west overhang. Heavy corrosion at the utility pipe clips. This defect is typical at all utility pipe clips at the west overhang.

PEDESTRIAN WALKWAY CONDITION

In general, the concrete sidewalk on the west side of the bridge has areas of abrasion/ wear with transverse, longitudinal and map cracks **(Photo 11)**. Map cracking exists intermittently throughout the pedestrian walkway, notably at the north end and at the manhole cover at the north approach **(Photos 12 & 13)**. There are numerous very small spalls and delaminations located adjacent to the base plates of the pedestrian rail connecting to the concrete sidewalk **(Photo 14)**. The concrete at the pedestrian barrier is undermined at the north end towards the raised section of fence **(Photo 15)**. Other inspection findings include minor leaching, undermining, and scaling of the concrete sidewalk adjacent to the CBR, minor corrosion of the pedestrian rail, damage to six (6) fence panels, minor debris buildup on the sidewalk, intermittent spalling **(Photo 16)**, and missing joint material and debris buildup in the joints **(Photo 17)**. The pedestrian rail was repainted in 2021 and chain link fencing was added that spans the areas between the rails. Damaged areas of the fencing identified in previous inspections have been repaired. In 2023, Suicide and Crisis Lifeline (988) signs were added on the walkway near the north and south ends and near midspan of the bridge.

A new drainage system was added in 2022 to the west side of the bridge which includes a gutter and downspout to capture the runoff and move the water away from the bridge **(Photo 18)**. Previously, there was a free flow of water over the west side of the pedestrian walkway which led to significant deterioration (debonding of steel protective coating and corrosion) of the superstructure particularly at the outriggers/ connection plates, spandrel girder/ splice plates, and arch rib located on the west side.

Element level data for the reinforced concrete deck (NBE 12) and assembly joint seals (BME 303) on the north and south ends of the bridge are attached at the end of this report. Element level data for the metal bridge railing (NBE 330) with steel protective coating (BME 515) are also provided.

Photo 11– General view of pedestrian walkway and guardrail, looking north.

Photo 12 – Map cracking at manhole cover at north approach of pedestrian walkway. Map cracking is typical throughout the pedestrian walkway.

Photo 13- Map cracking at the north end of the pedestrian walkway (TYP).

Photo 14- Corroded base plate with small spalls on surrounding walkway.

Photo 15- Undermining of the concrete bridge barrier towards the north end of the raised section of the fence.

Photo 16- (14”x10”x1/2”) spall at failed concrete repair towards north end of the pedestrian walkway.

Photo 17- Missing joint material and debris accumulation at north end of pedestrian walkway.

Photo 18- Drainage system (gutter) on west side of deck.

SUPERSTRUCTURE CONDITION

Based on the Routine Inspection and NSTM Inspection, the superstructure is rated in SATISFACTORY condition. The previous inspection classified the superstructure as FAIR, but this does not accurately reflect the condition of the superstructure. Element level data for the steel arches (NBE 141), steel columns (NBE 202), steel spandrel girders (NBE 107), steel floor beams including outriggers (NBE 152), and steel stringers (NBE 113) are attached at the end of this report. Data for the steel protective coating (BME 515) for all steel members are also provided.

The arch bridge members are in SATISFACTORY condition with minor paint failures at isolated locations on the top plates and exterior webs particularly on the west side. Where the paint has failed along the arch ribs there is minor corrosion of the steel, but no areas of measurable section loss (**Photo 19 and 20**). In general, the steel protective system was not applied to the superstructure components as thoroughly on the south side of the bridge as the north side. The quantity of paint failures does not appear to have changed since the previous inspection. The west arch rib is in worse condition than the east arch rib mainly due to the previous free flow of water spilling over the pedestrian walkway before a gutter was installed on the west side of the bridge. In approximately the middle 150 ft of the west arch rib, there are areas of minor corrosion on the top plate, web, and top of flange angles **(Photos 21-24)**. Any section loss was less than 1/32”. The east arch rib generally only has very minor corrosion with no section loss (**Photo 25**). The bottom of both arches is in good condition (**Photo 26**). Minor corrosion was noted at the north end of the west arch at the bearing (**Photo 27**). There are isolated areas of minor distortion primarily at the west arch rib.

The arch rib bracing members are in SATISFACTORY condition. Minor corrosion and paint peeling is typical throughout the bracing (**Photos 28-32**)

The arch columns are in SATISFACTORY condition. Minor corrosion along the edges and random paint peeling along the height is typical (**Photos 33-35**). The interior of the columns is in good condition. Minor corrosion and paint failure is typical at the connection of the arch column to the arch rib (**Photo 36**). Some connections have heavier corrosion with section loss. This was noted at columns 11W (**Photo 37**), 2W (**Photo 38**), 1E (**Photo 39**) and 1W (**Photo 40**). There are missing bolts and poor welds at the channel connections to the arch columns on both the west and east faces **(Photos 41 and 42)**. The missing bolt holes were mispunched in some cases, or no longer needed as the channel is welded to the column in lieu of bolting.

The spandrel girders are in GOOD condition but there are isolated areas of paint peeling with surface corrosion on the web and bottom side of the top flanges (**Photos 43-45**). There is minor corrosion and pack rust between the bottom flange plates of numerous spandrel girder splice connections particularly on the west side (**Photo 43**). A hands-on inspection was performed on the top plate, angles, and outrigger through bolts (**Photo 46**). Similar to the arch ribs, the west spandrel girder is in worse condition than the east spandrel girder due to water runoff. The east spandrel girder has minor impact damage at the bottom flange angle between the skewback column and the pier column on the north end and the arch rib also has impact damage.

Paint failure and moderate corrosion with section loss exists on the outrigger beams particularly on the west side; however, the section loss is located in an area on the beam of zero stress. The outrigger extends out past the stringer it supports. Since the outrigger is a cantilever, stress in the beam starts at the location of the applied load at the stringer and is a maximum at the spandrel girder connection. The section loss on the outrigger was noted on the exterior portion past the stringer (**Photos 47 and 48**). No measurable section loss was noted on the outrigger in areas of any stress (**Photos 49-51**). There is also moderate corrosion and pack rust/ distortion at the bottom channel connections **(Photo 52)**. This condition has not changed since the previous inspection. Typical rotational distortion of the outriggers (likely due to the construction process) was observed mainly on the east side and showed no signs of change. The through rod anchor bolts and connection plates that connect the outriggers to the floorbeam through the spandrel girder were inspected hands on the interior and exterior sides, as well as inside the spandrel girder. These anchor bolts and connection plates were all in good condition (**Photos 53-54**). Debris buildup and minor corrosion was noted on the connection plate on the east interior side at the south abutment (**Photo 55**).

The floorbeams are in SATISFACTORY condition (**Photo 56**), with small areas of paint peeling noted (**Photo 57**). In the interior, there are several locations where the floor beams are missing a bolt at the top bracket connection to the spandrel girders (**Photo 58**). There are also isolated locations with impact damage on the bottom flange angle (**Photo 59**). Bird nests were noted in many locations, but did not appear to be causing deterioration (**Photo 60**).

Stringers are in GOOD condition, but there are areas of paint peeling and corrosion on the top and bottom flanges particularly at stringers 1 and 6 (on the east and west sides of the bridge) (**Photos 61 and 62**). Welded cover plates, with a fatigue category E at the ends of the welds, exist on the stringers in the end spans (**Photo 63**). All of these welds were inspected, and no defects were noted. Moderate corrosion was noted on the bottom flange and web of the east exterior stringer at the south abutment (**Photo 64**).

Photo 19- East arch rib at column 7, peeling paint and minor surface corrosion with no measurable section loss.

Photo 20- West arch rib at column 7, peeling paint and minor surface corrosion with no measurable section loss.

Photo 21- Minor corrosion on top plate of west arch at column 5.

Photo 22- Minor corrosion on top plate of west arch at column 11.

Photo 23- Minor corrosion on top of bottom flange of west arch rib at column 11.

Photo 24- Minor corrosion on top plate of west arch between columns 10 and 9.

Photo 25- Minor corrosion on east arch at column 5.

Photo 26- Bottom of steel arch in good condition, at west arch center span looking south.

Photo 27- Minor corrosion at north end of west arch at the bearing.

Photo 28- General condition of bracing with minor corrosion and paint peeling at north end, looking south from skewback column.

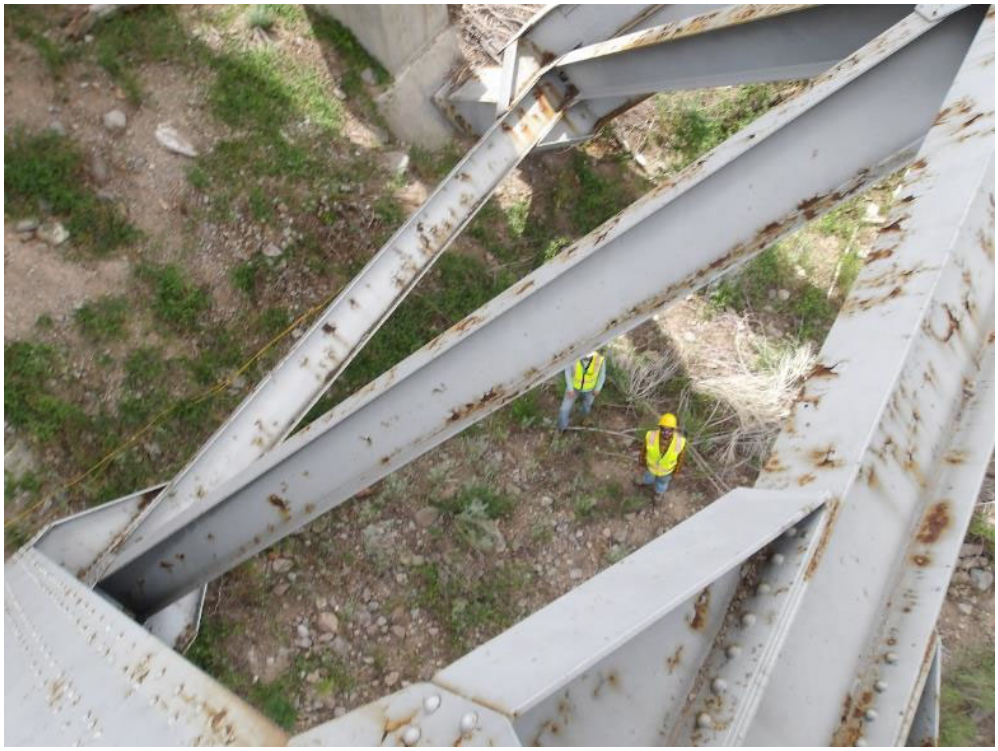


Photo 29- General condition of bracing with minor corrosion and paint peeling at south end, looking west from arch column 1.

Photo 30- Bracing connection at arch column 4 on E arch, paint failure and minor corrosion, typical.

Photo 31- General view of bracing looking south from arch column 5.

Photo 32- General view of bracing at center of arch in good condition.

Photo 33- Surface corrosion and paint failure at arch column 11, west.

Photo 34- General view of arch columns, looking north from arch column 11W.

Photo 35- Arch column 1W, minor corrosion and paint failure at base.

Photo 36- Arch column 13E, minor corrosion at base.

Photo 37- Heavy corrosion and minor thickness loss (1/32”) at the steel angle connection of arch column 11W.

Photo 38- 1/16” thickness loss to vertical gusset plate at arch column 2W.

Photo 39- Moderate corrosion and section loss to rivet heads on N side of arch column 1E.

Photo 40- Moderate corrosion on W side of arch column 1W.

Photo 41- Missing bolts and poorly welded connection at top of arch column. No change since previous inspection.

Photo 42- Mis-punched holes at top of arch column 14.

Photo 43- General view of spandrel girder in satisfactory condition, looking at arch column 10W. Note minor corrosion and pack rust at splice location.

Photo 44- General view of spandrel girder in satisfactory condition, east face near arch column 13E. Paint peeling and minor corrosion.

Photo 45- General view of inside top plate and angles of spandrel girder with small areas of failed paint with no corrosion, otherwise in good condition.

Photo 46- Hands-on inspection of top plate of spandrel girder and through anchor bolts for outriggers.

Photo 47- End of outrigger at FB27 west side, moderate corrosion and minor section loss in zero stress area.

Photo 48- End of outrigger at column 1W west side, moderate corrosion and section loss in zero stress area past the stringer. Minor corrosion with no section loss from stringer to spandrel girder.

Photo 49- View of outrigger at FB2 on West side, minor surface corrosion.

Photo 50- General view of outriggers in satisfactory condition, taken on west side at arch column 11.

Photo 51- Top of outrigger at arch column 6 on east side, minor surface corrosion, no measurable section loss.

Photo 52- Missing nut and broken bolt at outrigger gusset plate at arch column #8, west. Moderate corrosion and pack rust between channel and bottom of outrigger.

Photo 53- Typical connection of outrigger to floorbeam on interior side in good condition.

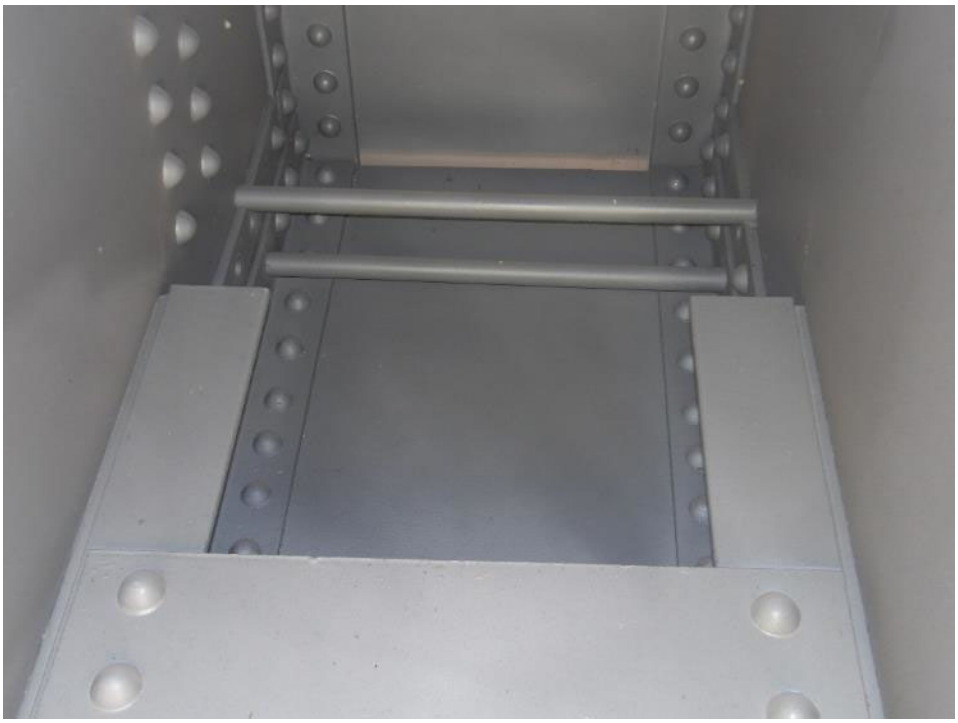


Photo 54- Typical view of interior of spandrel girder at outrigger through bolt connection in good condition.

Photo 55- East interior outrigger connection at south abutment, debris buildup and minor corrosion.

Photo 56- Floorbeams are generally in good condition. Floorbeam at south skewback shown.

Photo 57- Minor paint peeling on top flange of floorbeam typical.

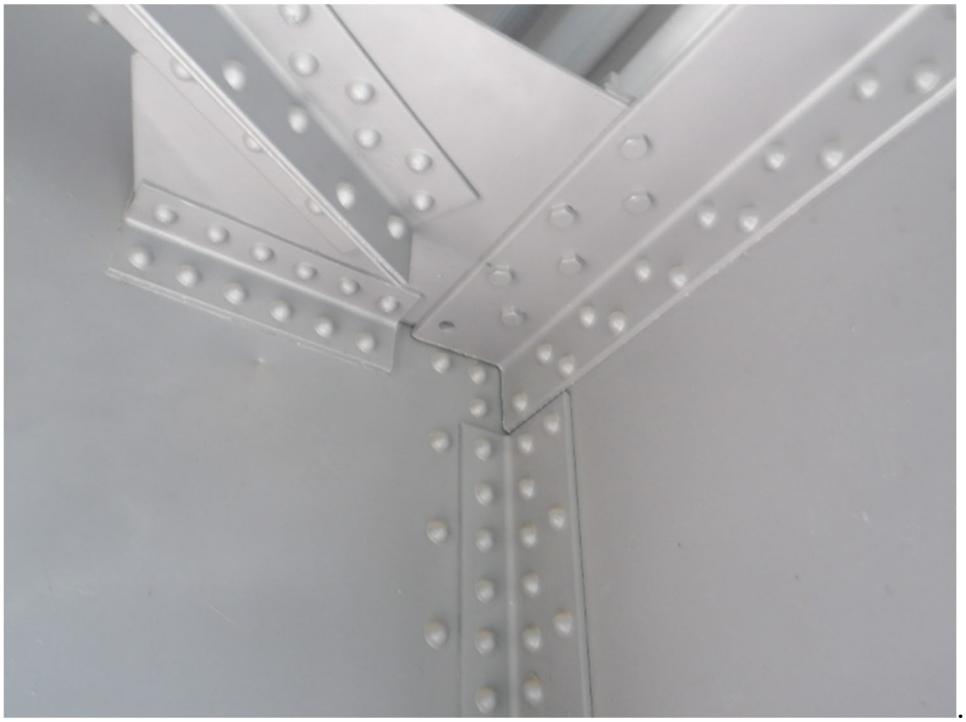


Photo 58- Typical missing bolt at connection of floorbeam angle to outrigger connection.

Photo 59- Typical minor deformation in bottom flange angle of floorbeam, east end of FB at column S1 shown.

Photo 60- Bird nest on top of connection plate and floorbeam top flange, noted in multiple locations on bridge, east side floorbeam at south skewback column shown.

Photo 61- General view of the interior stringers in good condition.

Photo 62- General condition of exterior stringer with peeling paint and surface corrosion on the bottom flange.

Photo 63- Ends of stringer cover plates in end spans. No defects noted.

Photo 64- East exterior stringer at south abutment, moderate corrosion in bottom flange and web.

ABUTMENT CONDITION

Overall, the substructure is rated in FAIR condition. Element level data for the reinforced concrete abutments (NBE 215) with concrete protective coating (BME 521) and movable bearings (NBE 311) on the north and south ends of the bridge are attached at the end of this report.

The substructure has been redesignated from POOR condition (NBI Condition Rating 4) to FAIR condition. Previous inspections designated the substructure as being in POOR condition due to the cracking and spalling located along the abutments and breast walls. There was concern that these conditions may reduce the substructure's load capacity; however, the cracks and spalls found at the abutment are not in the load path and do not inhibit the load capacity of the substructure.

South Abutment (#1): The south abutment is in FAIR condition. The top front edge of the top strut that spans between the columns that support each bearing exhibits cracking, delamination, spalling and exposed and corroded reinforcement (**Photos 65 and 66**). The dimensions of the delamination/spalling are 30' Long, 30" high on the front face, and extends 18" onto the top face. See Figure 10 for location of deterioration on this strut. Note that the deterioration ends before the columns that support the bearings. All concrete under the bearings is sound. One longitudinal bar has minor corrosion with minor section loss. The transverse ties were more heavily deteriorated with one tie having 100% section loss. Efflorescence from this deterioration has leached down the strut (**Photo 67**). Three pipes run across the top of the strut and have anchorages into the strut (**Photo 68**). These pipes would have to be temporarily relocated in order to perform a repair in this location, and they have likely accelerated the deterioration in this area. The abutment seat is covered in dirt and debris (**Photo 68**).

The back wall and wing walls exhibit random hairline cracking, most notably above the floorbeam in between the stringers, and small spalls (**Photos 69-72**).

Minor erosion is occurring at the south abutment, coming down the slope of the wingwalls, around the abutment, and towards the concrete pedestals that support the pier columns (**Photos 73 and 65**).

North Abutment (#2): The north abutment is in FAIR condition. It was previously sealed with a concrete protective coating which has significantly debonded resulting in exposure of the original concrete surface and leaching. The debonded areas vary in size **(Photo 74 and 75)**. Hairline vertical and horizontal cracks are typical across the top strut between the bearings (**Photo 75**). At the center of the strut, there is full height vertical cracking and small spalls with

exposed reinforcement (**Photo 76**). The top face of the strut is covered with dirt and debris, similar to the south abutment.

Map cracking exists on the east and west sides of the back wall, as well as between the stringers above the floorbeams. The east back wall has a medium width vertical crack that extends full height and hairline horizontal cracks (**Photo 77**). Horizontal cracks with efflorescence were noted on the west backwall emanating from wall penetrations for conduits (**Photo 78**). Hairline map cracking is typical at both wingwalls (**Photos 79 and 80**).

The steel top plate just under the expansion joint has cracked through the full thickness between stringers 3 and 4 (initially observed in 2006) and corrosion is evident at the crack and front edge of the plate (**Photo 81)**. This plate serves no structural purpose and was previously used as a support for an expansion joint at the abutment but was primarily used as a form for the bridge deck after the bridge rehabilitation.

The east side of the back wall and part of the east wingwall has a small area of undermining (**Photos 80 and 82**). The asphalt landing at the top of the slope has minor erosion **(Photo 83)**. Both conditions have not changed since the previous inspection. Previous inspection reports have indicated that there is settlement of the west end of the bridge seat. No apparent change in this condition was noted in the inspection.

Bearings:

South abutment: Soil has accumulated at the east and west bearings and the masonry plates are corroded with paint failure. At the southwest location, the bearing was realigned, and the keeper plate was replaced previously (between 08/06/14 and 08/13/14); both elements were also previously repainted **(Photo 84)**. Pack rust and minor section loss is present at the east and west bearings and some wearing on the masonry plates has occurred. The protective coating on the bottom of the southwest bearing and the baseplate on the southeast bearing is no longer effective **(Photo 85)**. The anchor bolts are in contact with the bearing device due to transverse movement in the east direction.

North abutment: the bearing elements are corroded with paint failure, and pack rust is present at east and west bearings (**Photos 86 and 87**). There is section loss on the base plate on the northwest bearing and the protective coating is no longer effective.

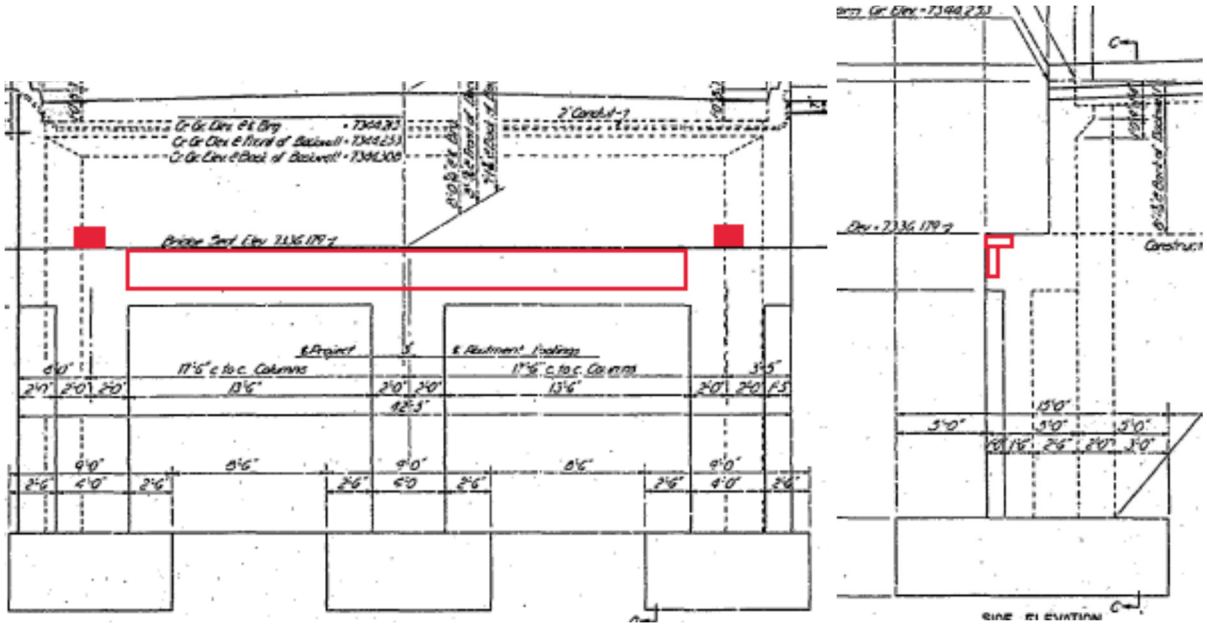


Figure 10- Sketch of concrete deterioration in top strut of south abutment. Solid red blocks indicate bearing locations, red unfilled squares indicate approximate location of concrete deterioration. Note deterioration ends at the columns that support the bearings. All concrete under bearings is sound.

Photo 65- Delamination, spalling and exposed rebar at south abutment top strut. Minor erosion of soil around abutment.

Photo 66- Delamination, spalling and exposed rebar at south abutment.

Photo 67- Efflorescence leaking down the face of the south abutment top strut.

Photo 68- Top of south abutment strut. Three pipes with anchorages into the strut exist. The strut is covered in dirt and debris.

Photo 69- 6”x1’ spall between stringers 4 and 5 at the south abutment.

Photo 70- Cracking along southern abutment between stringers 2 and 3. Typical at the southern abutment.

Photo 71- East wingwall at south abutment. Small spall with exposed reinforcement.

Photo 72- West wingwall at south abutment.

Photo 73- South abutment embankment, looking at pier 1 from south abutment. Minor erosion down slope and around piers.

Photo 74– Elevation view of north abutment. Debonding of concrete protective coating is present throughout the abutment.

Photo 75- Debonding of concrete protective coating at north abutment. Also, hairline vertical and horizontal cracking along the top strut.

Photo 76- Vertical cracking and small spalls at center of north abutment.

Photo 77- Medium width vertical crack and hairline horizontal cracking on east face of backwall at north abutment.

Photo 78- Rust staining and horizontal crack with efflorescence on west backwall at north abutment.

Photo 79- West wingwall at north abutment, hairline map cracking. Efflorescence around light pole pedestal and concrete cutout for joint.

Photo 80- East wingwall at north abutment, hairline cracking. Undermining at south end of wall, wrapping around to the backwall.

Photo 81- Cracked steel plate at north abutment.

Photo 82- 48”x6” area of undermining at the east back wall of the north abutment.

Photo 83- Erosion of asphalt at north abutment.

Photo 84- West bearing at south abutment with corrosion, rust staining and debris buildup.

Photo 85– Corrosion and rust staining at southeast bearing with debris accumulation on the abutment seat.

Photo 86- Northwest rocker bearing with paint failure and laterally displaced bolt with partially threaded nut.

Photo 87- Northeast rocker bearing with paint failure corrosion.

PIER CONDITION

Overall, the piers are rated in FAIR condition. Deficiencies for the concrete columns and bearings are listed below. Generally, the deficiencies are minor. Element level data for the reinforced concrete columns (NBE 205), movable bearings (NBE 311), fixed bearings (NBE 313), and other bearings (NBE 316) are attached at the end of this report.

South Pier Columns (#1)

East Concrete Column	
Location	Notes/Comments
North Face	- 55" to 61" exposed face - Map cracking up to 0.010" wide at 9" spacing
South Face	- 28" to 33" exposed face - Map cracking (0.007" wide) and single vertical crack (0.013" wide)
East Face	- Map cracking (0.009" wide at less than 6" spacing) on 29" to 55" exposed face - 7 in. spall on SE corner - 6" x 6" delamination near center of face **(Photo 88)**
West Face	- 36" to 61" exposed surface - Minor horizontal and vertical cracking 0.013" wide
Top Face	- Bolts not fully engaged - Moderate scaling with cracks on chamfers (extend into vertical faces) - Minor pack rust under bearing and above masonry plate - Minor corrosion on both sides between rocker and masonry plate - Cracks up to 0.02" wide at approximately 12" spacing

West Concrete Column	
Location	Notes/Comments
North Face	- 50" to 65" exposed surface with map cracking - 9" wide x 18" long x ½" deep spall and map cracking up to 0.016"
South Face	- 6" diameter spall - 0.01" vertical crack - Map cracking (0.007" wide at 8" spacing) - Exposed surface continues to increase due to erosion (22" to 40")

East Face	- 43" to 67" of exposed surface - Map cracking up to 0.010" - Honeycombing on NE corner - Vertical crack with leaching and minor rust staining **(Photo 89)**
West Face	- 26" to 45" exposed surface - Minor rust straining from form steel - Minor horizontal and vertical cracking 0.013" wide
Top Face	- Cracks on chamfers (extend into vertical faces) - Minor Pack rust under bearing and above masonry plate - Minor corrosion on masonry plate at bearing contact area - Cracks up to 0.02" wide at approximately 12" spacing

South Pier Columns (#2)

East Concrete Column	
Location	Notes/Comments
North Face	- 9'-9" exposed face has map cracking (0.013" wide)
South Face	- Map cracking (0.020" wide at 6" spacing)
East Face	- Map cracking up to 0.020" (primarily towards top). Minor corrosion of bolt and bottom of plate. **(Photo 90)** - Single vertical crack (0.020" wide) down 36" from top
West Face	- 7' to 11'-6" exposed face has two vertical cracks (0.016" wide) down 12" from top and map cracking up to 0.013" (primarily towards top) - Horizontal crack at mid-height
Top Face	- Moderate cracking, 0.020" wide (extends into vertical faces about 6 to 8 in.) - Fixed bearing coating sound, all bolts in place - Corrosion on base of nut on masonry plate - Freckled rust on base of masonry plate

West Concrete Column	
Location	Notes/Comments
North Face	- Map cracking (up to 0.025" wide) - Efflorescence on west corner - 114" to 120" exposed face

South Face	- 57" to 60"exposed surface with map cracking (0.013" wide) sealed with epoxy **(Photo 91)** - Horizontal cracks (0.060" wide) and delamination towards top extending 3/4 the width of the column - Epoxy seal broken at several crack locations
East Face	- Moderate scaling towards top and minor scaling towards bottom - Cracks sealed with epoxy showing through (up to 0.030") - Map cracking towards top (0.010" - 0.030" at 4" spacing) - Vertical crack (0.030" wide) extending approximately 36" down - Epoxy seals broken - 71" to 113" exposed face
West Face	- Moderate scaling towards top and minor scaling towards bottom - Cracks sealed with epoxy showing through - Map cracking (up to 0.016" wide) - Efflorescence forming at crack locations - Staining near the top of the column - SW corner delamination 10" x 8" - NW corner spalling (approximately 12") with delamination under spall. Also cracking with minor efflorescence **(Photo 92).** - 59" to 106" exposed face
Top Face	- Moderate to heavy scaling (more on west and south region) - Cracking and delamination on north and south regions - Delaminations spalling **(Photo 91)** - Rust staining originating from anchor bolts on west side, minor section loss on nuts - Fixed bearing coating sound with some isolated peeling and staining - Corrosion extends to bottom of column including rivets - Epoxy seal broken - Staining towards top from masonry plate - Map cracking more significant towards top - Cracking towards edge (0.025" wide)

North Pier Columns (#3)

East Concrete Column	
Location	Notes/Comments
North Face	- 0" to 25" exposed face with 4" x 4" spall approx. 8" from NW corner - Hairline map cracking (0.002" wide)
South Face	- Map cracking on 32" to 55" exposed face (less than 6" spacing and 0.020" wide) - Minor spalls - Vertical cracks 0.016" at< 6" spacing

East Face	- Map cracking (0.007" wide) plus full-depth vertical crack (0.010" wide) on 0" to 32" deep exposed face - Horizontal cracks up to 0.016" at SW corner - Pin paint no longer effective on east side - Two small (1/2") spalls at top of column
West Face	- Map cracking on 32" to 55" exposed face - Two full-height vertical cracks at 12" spacing and 0.010" wide with leaching - Small spalls along vertical cracks with staining
Top Face	- Moderate to heavy scaling - Several spalls measuring 4" x 4" to 6" x 6" exposing square rebar - Minor corrosion around perimeter of masonry plates and anchor bolts - Paint starting to pull away from plate - Metal exposed with surface rust - Pop-outs on chamfer

West Concrete Column	
Location	Notes/Comments
General	- Cracks sealed previously are worse on west side; map cracking; horizontal cracking from 10"-12" down and around south face - Scaling on top surface (aggregate exposed) - Corrosion with section loss on bolts and masonry plate - Column has some pack rust on transition to support
North Face	- Map cracking up to 0.040" with leaching at crack locations on 8" to 24" exposed face - Horizontal crack approx. 12" down with leaching (continues around to south face) - Spall near bottom middle of exposed face and a crack approximately 4" to the left of the spall - Cracks previously sealed - ½" of undermining under northwest potion of bearing pad **(Photo 93)**
South Face	- Map cracking up to 0.020" on 65" to 69" exposed face - Scaling top west corner - Staining on bottom center; 6"x6" delamination on west side toward top - 8"x8" delamination at center of face **(Photo 94)**
East Face	- Map cracking up to 0.012" wide at 12" spacing with leaching at crack locations on 34" to 62" exposed face
West Face	- Map cracking up to 0.025" wide (at 8" spacing horizontally and 4" vertically) with leaching at crack locations on 36" to 67" exposed face - Horizontal crack 0.023" wide extending from north to south face

Top Face	- Cracking (0.030" wide at 6" spacing, extend into vertical faces) - 4" x 4" spall on NW corner of masonry plate - Heavy corrosion around perimeter of masonry plates and anchor bolts (coating is sound)

North Pier Columns (#4)

East Concrete Column	
Location	Notes/Comments
North Face	- Covered with soil (not visible)
South Face	- 10" exposed face with map cracking - 0.030" crack on SE corner
East Face	- 0" to 6" exposed face with map cracking - Crack on south corner from spall on top face
West Face	- Partially exposed with map cracking - Cracks near anchor bolts
Top Face	- Map cracking up to 0.030" wide at 12" spacing - Anchor bolts do not extend fully through top nuts - Minor corrosion around perimeter of masonry plates and anchor bolts - Spall on SE corner with cracks down south and east faces up to 0.040"

West Concrete Column	
Location	Notes/Comments
North Face	- Covered with soil (not visible)
South Face	- 7" to 13" exposed face with map cracking
East Face	- Covered with soil (not visible) - Minor crack on NE corner with small spall of less than 6"
West Face	- 3" to 13" exposed face with map cracking - Minor undermining of SW corner - Riprap added to help prevent erosion

Top Face	- Map cracking up to 0.030" wide at 10" spacing - East anchor bolt does not extend through top nut - Minor corrosion around perimeter of masonry plates and anchor bolts - Protective coating is sound - Small spall on SE corner - Fretting corrosion around pin - Pack rust at bearing/masonry plate

* NOTE: Riprap and netting installed to control erosion on the embankment near west concrete column

South Skewback Columns (#1)

East Concrete Column	
Location	Notes/Comments
General	- Top half concrete finish not effective
North Face	- Moderate cracking visible in the concrete finish - Protective coating debonding towards base - 30% debonding toward top of finish - Rust staining at top end - 0.020" to 0.050" vertical cracks at 11" spacing (40% of height) - cracks in line with anchor bolt - Efflorescence - Small spall near top 6" x 6" - Abrasion with exposed aggregate on original concrete (1' x 1' + 1' x 2' + 1' x 1') at top of column
South Face	- Moderate cracking visible in the concrete finish up to 0.060" - Map cracking at about 1' spacing (0.040" - 0.050" wide) - Two cracks starting at top end from bolts (entire height) - 2' x 2' delaminated patch at base of seal has spalled - Efflorescence along vertical cracks - Debonding of concrete finish - Delamination near mid-height 12" x 12"
East Face	- Moderate cracking visible in the concrete finish - Map cracking (0.030" wide) approx. 8' from top - Debonding of finish toward top (10%)

West Face	- Moderate cracking visible in the concrete finish - Scaling and debonding (30%) of finish about half the depth - Vertical crack at center of face (full-depth, at least 0.060" wide) - possible initiation of delamination - 2 full depth cracks 12" apart - Entire column has abrasion with exposed aggregates (loss of aggregates) - Finish is bubbling and trapping moisture, has some efflorescence
Top Face	- Not visible - Minor rust staining visible towards top of vertical faces (possibly originating from top face)

* NOTE: Erosion cavity (6' x 4') on southwest corner of column exposing bare concrete.

West Concrete Column	
Location	Notes/Comments
North Face	- Moderate cracking visible in the concrete finish - Scaling and debonding (25%) of finish near top and middle of column - Rust staining at top end; 0.060" wide crack at middle of pier over full height (debonding along length of crack) - Original concrete exposed - Spalling (8" x 6") - Tree growing on NW side
South Face	- Cracking in the concrete finish - Scaling, bubbling, and debonding (100%) of finish (along with rust staining) - Vertical crack on bottom half of height - Two vertical cracks (greater than 0.060" wide) - Larger cracks near top and bottom - Efflorescence on surface finish and concrete - Separate concrete castings - Concrete abrasion (approximately 4 ft^2)
East Face	- Cracking visible in the concrete finish - Scaling of finish (debonding along height) - Two major cracks at middle of pier over full height (0.060" wide) approximately 1.5' apart - Vertical crack 0.030" full height - Concrete exposed with exposed aggregate near mid-depth with efflorescence - Efflorescence is concentrated near debonded areas (more towards bottom) - 12 sq ft delamination and 3 sq ft of spalling

West Face	- Moderate cracking in the concrete finish - Two full-height vertical cracks (up to 0.060" wide) plus initiation of map cracking - Debonding (5%) of surface concrete finish over height - Exposed concrete in isolated areas - Bubbling of surface coating - Staining on lower¼ of pier
Top Face	- Not visible - Minor rust staining visible towards top of vertical faces (possibly originating from top face)

South Arch Abutments/Fixed Bearings/East
Notes/Comments
- Rust on exposed masonry plate (5%) - No surface concrete finish on abutment - Bearing covered with soil/debris on west side and east side - Pack rust between arch and bearing

South Arch Abutments/Fixed Bearings/West
Notes/Comments
- Minor corrosion (approximately 25%) on inside plates - No surface concrete finish on abutment - Map cracking (0.020" wide) at approximately 8" spacing - Delamination of east side, 24"x12" with efflorescence - Bearing partially covered with soil/debris on west side and east side - Lower half of plate not visible - Cover plate to bearing plate loose

North Skewback Columns (#2)

East Concrete Column	
Location	Notes/Comments
General	- Majority of cracks on top half of column (most have previously been sealed, cracks exposed through seal) **(Photo 95)**
North Face	- Minor to moderate cracking - Cracks sealed with epoxy near top (1' spacing) but showing through seal - Map cracking (0.016" wide) on top¾ of column height - 4" x 5" delamination at 4' of height at NW corner - Exposed aggregate (abrasion) on corners

South Face	- Light scaling - Effective patched spall at top end (4'x4') - Map cracks (0.020" wide at 12" spacing) over full height - Small aggregate pop-outs near bottom (approximately 1") - Resurfaced area (3'x3') toward top in good condition - Sealed towards bottom, starting to honeycomb with exposed aggregate - Patch with honeycombing near bottom (delamination 6" x 6" near bottom)
East Face	- Moderate map cracking (0.016" - 0.020" wide at approximately 12" spacing) over full height - 12" x 12" spall has been patched, cracks forming along edge of patch and spalling of patch on top corner - Sealed cracks showing through epoxy - Two spots of corrosion near bottom (form steel) - Abrasion with pop outs and abrasion at corners
West Face	- Moderate map cracking (0.020" wide between 9" and 12" apart) and scaling - Cracks sealed with epoxy and extend full height - Cracks propagated through epoxy
Top Face	- Not visible

* NOTE: North-west corner has small delamination

West Concrete Column	
Location	Notes/Comments
General	- Crack widths increase starting at mid-height - Sealed ~ 3' near top - Cracks showing through
North Face	- Vertical cracks extend full height (0.016" - 0.040" wide and spaced at 8" - 12" apart) and horizontal cracking at mid-height - Moderate cracking (top end sealed similar to abutment) - Vertical crack 0.016" - 0.030" wide near west edge of north face - Efflorescence (continues to advance) approximately 1/8 of height near west face - Concrete seal has cracks near top - Cracking is towards west side (>0.050") but is only on north face

South Face	- Light scaling - Vertical cracks extend full height (0.016" wide at 12" spacing) - ~ 6' from top, horizontal crack extends 2/3 of width - Abrasion visible on west side, bug holes/pop outs - Staining caused by corrosion on steel column - Delamination on the skewback (3" x 3") [might be top cover concrete only] - Cementitious coating approximately 50% effective
East Face	- Light scaling toward bottom and moderate map cracking (0.010") - Top sealed (3' height) - Vertical cracks extend full height (0.025" wide spaced 6" apart) - Top, east side has delaminations that extend down
West Face	- Vertical cracks (0.020" wide) extend full height (spaced at about 4" - 6") - Efflorescence at cracks near top; map cracking 2" - 4" apart, build up is visible - Abrasion in chamfer area with exposed aggregates but aggregate still secure (near areas with efflorescence) - Moderate crack on NW corner - 0.040" wide - Debonding of concrete with >1" wide spall (horizontal) on top region in line with rebar **(Photo 96)** - Horizontal crack approximately 6" down from top discolored leaching, possible exposed rebar - Spalling on chamfer area (4.5' long) - Erosion occurring west of the skewback (**Photo 97**)
Top Face	- Not visible

North Arch Abutments/Fixed Bearings/East
Notes/Comments
- Map cracking at 6" spacing (0.020" - 0.025" wide) (**Photo 98**) - Erosion on east side exposing unpainted concrete - Starting to flake in isolated areas (~ 5' x 5') - Pack rust between bearing and arch rib - Stains extend to concrete bearing - Two bolts on topside not fully engaged with nuts - Delamination on west side of masonry plate (18"x12") - Delamination on east side of skewback (3'x6") - Bottom of masonry plate has corrosion with section loss - Top concrete finish spalling off - NE corner - delaminations with initiation of spalling - Corrosion around perimeter - Arch rib is in contact with west side of bearing - Top cover plate a bit loose

North Arch Abutments/Fixed Bearings/West
Notes/Comments
- Map cracking at about 4" - 6" spacing (0.009" - 0.030" wide) - Honeycombing and abrasion {6"x6") - Surface concrete finish moderate (on abutment and bearings) - Starting to peel - Pack rust between bearing and arch rib - Corrosion around masonry plate (**Photo 99**) - Staining extends to concrete - Section loss on masonry plate - Isolated corrosion of base metal (about 1%) - Protective top plate has corrosion - More staining and corrosion than east side (due to more water runoff; observed in rain) - 6" x 6" spall on east side with delamination (6"x6") - 12" x 6" spaII on west side of masonry plate - Effiorescence on west side cracks - Leaching (approximately 36 ft^2) - Cracks larger on the west side - Protective finish on west face in good condition, moderate on east side - Erosion has exposed bare concrete around base (no surface protective finish on west side and front of skew back) - Concrete spaII at bottom of masonry plate - Abrasion throughout - Honeycombing on south face (I'x6') - Staining extends from bearing to the concrete at bottom of masonry plate - Arch rib in contact with east side of bearing

Photo 88- East face of concrete pier column 1, east.

Photo 89- East face of concrete pier column 1, west.

Photo 90- Minor paint failure of the eastern bolts and bottom edge of the bearing at concrete pier column 2, east. Note vertical hairline crack along eastern face and pier cap. This crack extends down the height of the pier column.

Photo 91- Large spall at the southwest corner and along the western and southern top edges of concrete pier column 2, west. Photo is looking north.

Photo 92- West face of concrete pier column 2, west, with efflorescence and crack repairs. Note 1’x1’x1/2” spall on northwest corner.

Photo 93- ½” deep undermining at the northwest portion of the bearing pad at concrete pier column 3, west.

Photo 94- 8”x8” area of delamination with small spalls and associated cracking (hairline to 1/16”) at southern face of concrete pier column 3, west.

Photo 95- North face of northeast skewback column with patched hairline cracking.

Photo 96- Spalling and debonding (6”x full width of column) of the concrete at the west face of northwest skewback column. This condition extends 2’ into the north face of the column.

Photo 97- View of erosion running down canyon wall immediately west of the northwest skewback column.

Photo 98- Map cracking throughout the east face of the northeast arch base.

Photo 99- Map cracking and rust staining at south face of northwest anchor base.

STEEL COLUMNS AND BRACING

The steel columns at piers 1-4, and at the skewback columns are in SATISFACTORY condition, similar to the other steel on the bridge. The portal bracing towers and lateral bracing members are overall in FAIR condition. The paint has failed in numerous areas throughout the bracing members and there is minor corrosion in these areas with no measurable section loss. See **Photos 100-101** for general photos.

Photo 100- View of North skewback columns. Minor paint peeling and corrosion on bracing members.

Photo 101- General view of columns at Pier 2.

APPROACH ROADWAY CONDITION

In general, the transitions between approaches and bridge deck experience impact loading due to vertical/ horizontal alignment and use of roadway equipment (e.g., snowplows) and horizontal curves at the north and south approaches. A minor speed reduction is required, therefore NBI item 72 is coded a 6.

At the north approach roadway, minor defects and deterioration including longitudinal cracks on the southbound / northbound lanes were observed on the roadway (**Photo 102 and 103**). There are spalls and delaminations on the header near the expansion joint (**Photo 104**). The grate openings for drainage on the east and west sides had minimal debris.

* NOTE: the north approach roadway was repaved and restriped before the 2021 inspection and the expansion joint was replaced during the 2022 inspection.

At the south approach roadway, longitudinal cracks are present between lanes (**Photo 105**). Some spalling of the asphalt has occurred and there are several spalls and delaminations near the header and joint (**Photo 106**). The grate openings for drainage have minor debris accumulation on the east and west sides.

* NOTE: the south approach roadway repaving was completed in 2018 and the expansion joint was replaced during the 2022 inspection. Patch repairs of the asphalt were made in 2023.

Element level data is not applicable to the approach roadway.

Photo 102- North approach, looking south.

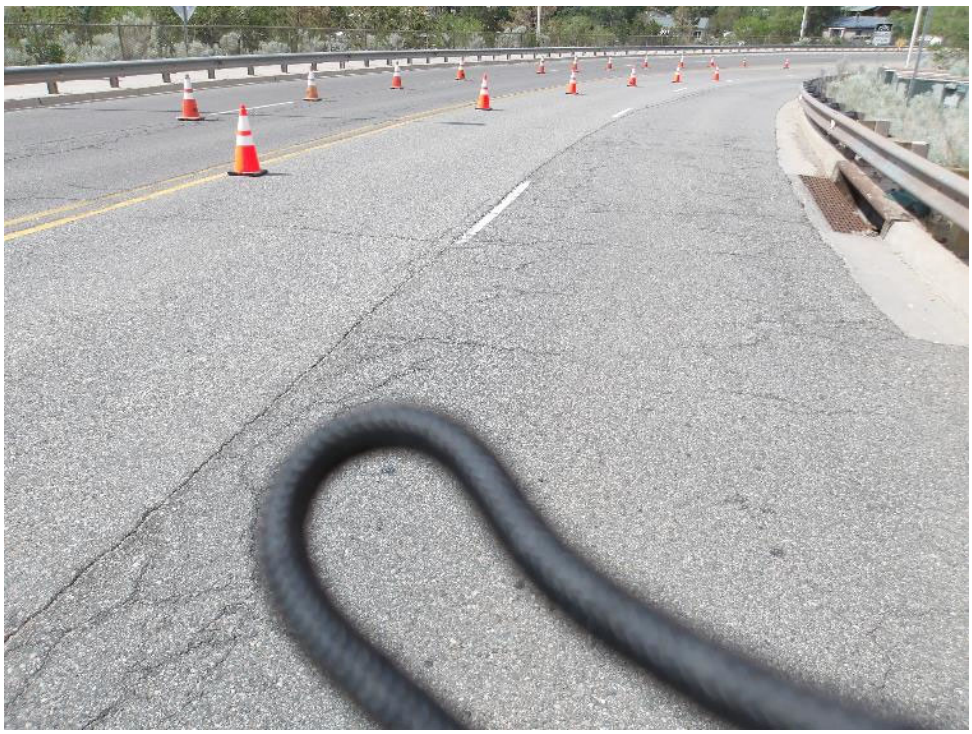


Photo 103- North approach looking north with random cracking.

Photo 104- Deterioration of asphalt and concrete on the approach side at the north abutment joint.

Photo 105- General view of south approach looking north.

Photo 106- Deterioration of asphalt and concrete on the approach side at the south abutment joint.

BRIDGE RAIL CONDITION

In general, the concrete barrier rails (CBRs) on the east and west sides of the bridge have vertical, horizontal, and map cracks with isolated areas of traffic damage. Additionally, there are several delaminations on the CBR that were repaired as part of the rail maintenance. The vertical cracks are concentrated near the drain holes at the bottom of the CBR and extend the full thickness of the CBR **(Photo 107)**. Cracks radiating from the joints is also typical along the concrete barrier rail, particularly at the joints **(Photo 108)**. Previously repaired patches have new delaminations and spalling (**Photo 109-110**).

The metal rails were replaced prior to the 2022 inspection. Since replacement, the metal rails have locations of paint peeling, and corrosion has initiated at several locations **(Photos 111-112)**. Additionally, there has been some collision damage to many of the vertical rail to concrete barrier connections on both the east and west side of the bridge. This damage has resulted in distortion of these members **(Photo 113-114)**. Impact damage has also caused large cracks and complete separation of concrete at one location on the west rail (**Photo 115**) and at multiple locations on the east rail (**Photo 116**).

The steel rail terminates in a blunt end at all four corners of the bridge (**Photo 117**). This poses a safety hazard to drivers in the event of a crash. The ends should be extended and turned down on a radius.

The Suicide and Crisis Lifeline signage was also placed at the north and south ends of the bridge rail as well as near midspan on the east side of the bridge.

In the element level data attached at the end of this report, the bridge rails located on the east and west sides of the roadway were separated based on material. The reinforced concrete bridge railing (NBE 331) corresponds to the CBRs located on both sides of the roadway. The metal bridge railing (NBE 330) corresponds to the steel pipe rails attached to the top of the CBRs. In addition, a metal bridge rail was used to describe the rail located on the west side of the pedestrian walkway. Furthermore, data for the steel protective coating (BME 515) for the metal bridge railings are provided.

Photo 107- Vertical hairline crack in the west concrete barrier rail emanating from drain hole at bottom (TYP).

Photo 108- 1/8” crack in the west concrete barrier rail immediately above the southern joint.

Photo 109- Spall (2’x Full Width x 1/2”), 1/8” cracks, section loss, and rust staining at the west concrete barrier rail at the north joint. Note undermining of concrete barrier rail and missing joint material.

Photo 110- Large (3’xFull Widthx1”) spall in the west concrete barrier rail at midspan.

Photo 111- Paint failure along the western rail at midspan (TYP).

Photo 112- Paint failure at the west guardrail-concrete barrier rail connection.

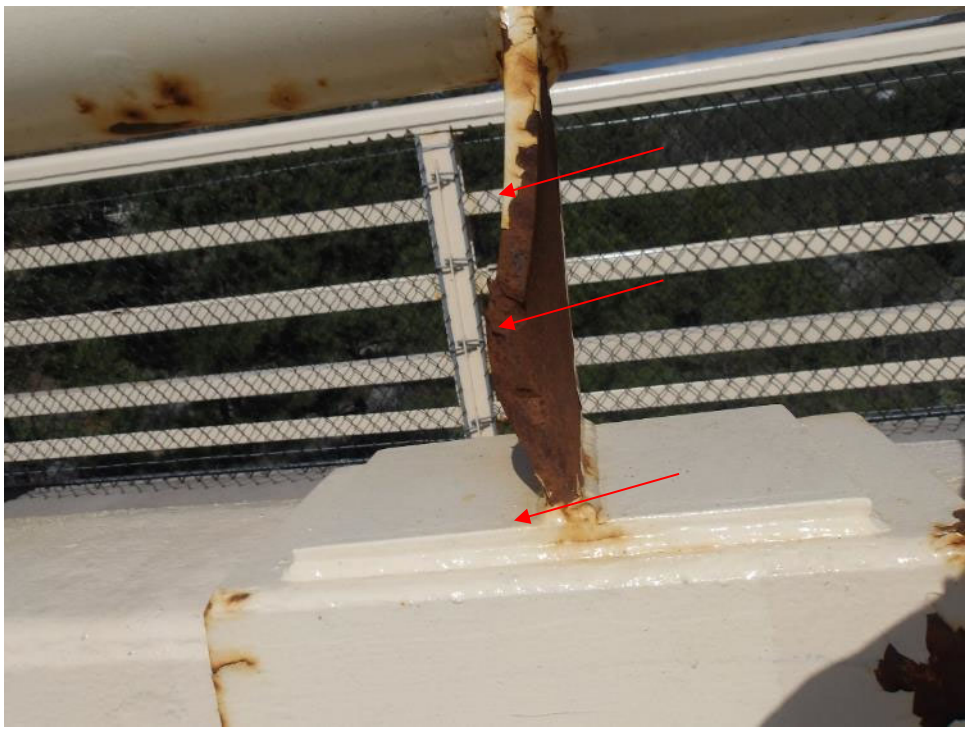


Photo 113- Impact damage to the western bridge rail-concrete barrier rail connection (TYP).

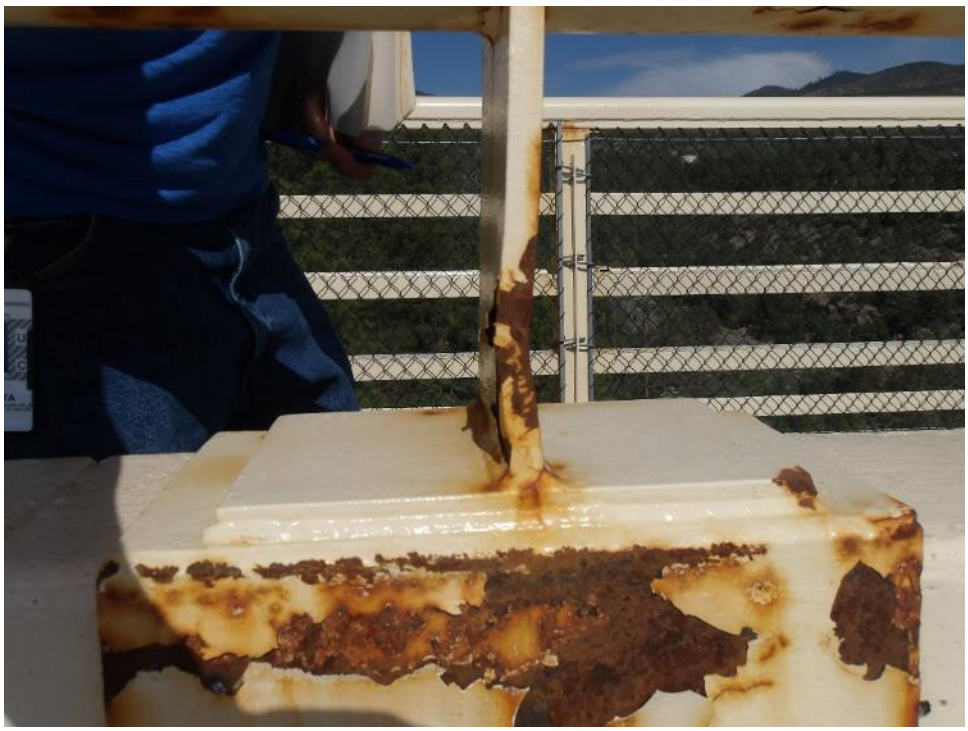


Photo 114- Paint failure and impact damage at the western guardrail connection (TYP).

Photo 115- Spall and cracking of concrete at the west guardrail-concrete barrier rail connection towards the north end of the pedestrian walkway.

Photo 116- Impact damage on the east bridge rail near the south abutment has caused cracking and spalling of concrete with complete separation of concrete at 6 connections.

Photo 117- Steel railing terminates with a blunt end that poses a safety hazard in the event of a crash.

APPROACH GUARDRAIL CONDITION

The approach guardrails consist of a steel guardrail with timber blackouts on timber posts at the terminals or rubber blackouts on steel posts along the length. All guardrail connections to the concrete rail are in GOOD condition and properly detailed (**Photo 118**).

Prior to the 2022 inspection, the north approach guardrail had been repaired in response to a critical finding reported in 2021 for safety reasons. The northeast guardrail is in GOOD condition (**Photo 103**).

At the south approach guardrail, there is minor collision damage on the east side. The steel guardrail has a minor bend in it. The timber blocking on the east rail has been replaced since the last inspection. Some timber posts are split along their height and/or deformed at the base in the terminal end, but this generally does not affect the terminal as it is designed to have the rails break on collision (**Photo 119**). There is no steel guardrail on the south west side, as the concrete transitions down to meet with the curb (**Photo 120**)

Element level data is not applicable to the approach guardrails.

Photo 118- Southeast approach guardrail, looking north.

Photo 119- Southeast end terminal. Note new timber blocking place at posts.

Photo 120- Southwest approach concrete barrier rail transition, looking south.

Spandrel girders are in GOOD condition. There are isolated areas of paint peeling with surface corrosion on the web and bottom side of the top flanges. There is minor corrosion and pack rust between the bottom flange plates of numerous spandrel girder splice connections, particularly on the west side. Similar to the arch ribs, the west spandrel girder is in worse condition than the east spandrel girder due to water runoff. The east spandrel girder has minor impact damage at the bottom flange angle between the skewback column and pier column on the north end and the arch rib also has impact damage.

In general, paint failure and moderate corrosion with section loss exists on the outrigger beams particularly on the west side. However, the section loss is located in an area on the beam of zero stress. The outrigger extends out past the stringer it supports. Since the outrigger is a cantilever, stress in the beam starts at the location of applied load at the stringer and is a maximum at the spandrel girder connection. The section loss on the outriggers was noted on the exterior portion past the stringer. No measurable section loss was noted on the outrigger in areas of any stress. There is also moderate corrosion, pack rust, and distortion at the bottom channel connections. This condition has not changed since the previous inspection. Typical rotational distortion of the outriggers (likely due to the construction process) was observed mainly on the east side and showed no signs of change. The through rod anchor bolts and connection plates were inspected hands on and are all in GOOD condition.

The floor beams between the spandrel girders are in GOOD condition.

CHANNEL AND CHANNEL PROTECTION — NBI ITEM 61 CONDITION CODE- **N**

Not applicable.

SCOUR CRITICAL — NBI ITEM 113STATUS CODE-**N**

Not applicable.

UNDERWATER INSPECTION — NBI ITEM 92B CODE- **N**

Not applicable.

COMPLEX BRIDGE FEATURES

Not applicable.

UTILITIES AND ANCILLARY STRUCTURES

Utilities and ancillary items include fencing installed on the pedestrian rail (includes panels spanning the gaps between the individual rails and a raised section on the 150 ft portion center portion of the bridge length), light poles, and electric and steam utilities. During the 2023 Routine Inspection, a few damaged areas of fencing were found on the panels and raised section. These sections of damaged fencing have been replaced. The light poles and supports have light to heavy corrosion and were repainted in 2021. The covering of the electric and steam utilities was damaged at isolated locations, in particular, at the knee joint locations under the west spandrel girder at the north and south ends. This steam pipe serves the Health Research Laboratory. In addition, the hanger rods supporting the utility lines are distorted at isolated locations perhaps due to temperature-induced movement.

Recommendations and Cost Estimates

Recommendation	Priority	Estimated Cost	Consequence of Delay	Date	
				Recommended	Complete
Priority 1					
Round/ turn down steel bridge rail ends	1	----------	Traffic accident/ vehicle impact	2023	
Priority 2					
Install erosion protection for substructure	2	----------	Undermining of substructure elements	prior to 2023 (unknown)	
Repair/ repaint movable bearings at abutments	2	----------	Restricted bridge movement	prior to 2023 (unknown)	
Repair concrete at abutments and piers	2	----------	Loss of load capacity	prior to 2023 (unknown)	
Repair deck delaminations	2	----------	Safety to drivers	2024	
Repair Concrete on east and west bridge rails under steel rail connections	2	----------	Safety to drivers	2024	
Priority 3					
Reseal joints on gutter located on pedestrian walkway	3	----------	Gutter leakage & less effective drainage	2023	
Remove debris around abutment bearings	3	----------	Continued debris buildup/ restricted bridge movement	Prior to 2023 (Unknown)	
Perform ultrasonic testing of bearing pins	3		Bearing failure due to internal defects	Prior to 2023 (Unknown)	
Repaint superstructure	3		Advanced corrosion of superstructure elements	Prior to 2023 (Unknown)	
Repair collision damage to metal bridge rail (east side)	3		Traffic damage/ vehicle impact	2023	

Completed Repairs					
Repair collision damage to metal bridge rail (west side)			Traffic accident/ vehicle impact		2022
Repaint pedestrian rail			Advanced corrosion of rail base plates & anchors		2022
Repair/ replace steel plate under north expansion joint			Joint performance issues	2023	2024 (this plate is non-load bearing, no need to do this)
Repair concrete & repaint steel of bridge rails			Traffic accident/ vehicle impact		2022
Repair outriggers/ arch ribs in areas with section loss			Loss of load carrying capacity	Prior to 2023 (Unknown)	2024 (No Section loss reduces load carrying capacity)
Repair corroded light poles			Improper lighting/ traffic accident	2022	2023 (Repaired)
Clear out vegetation surrounding piers			Erosion issues & inspection obstacles	2023	2024 (vegetation not noted)
Measure section loss on members with moderate to heavy corrosion			Inaccurate estimate of load carrying capacity	prior to 2023 (unknown)	2024
Install drainage system on west side of pedestrian walkway			Advanced corrosion of bridge elements on west side		2022
Repair north approach guardrail			Traffic accident/ vehicle impact		2022
Upgrade pedestrian rail to current standards			Pedestrian traffic accident		2022 (Fencing Installed)
Repair/replace joints (as needed based on damage)			Vehicular traffic accident & abutment deterioration		2022
Repair/Replace damaged fencing on pedestrian rail			Pedestrian Traffic Accident	2023	2024

Evaluation Summary

Evaluation	Evaluation Status *(Complete, Underway, Not Completed, N/A)*	Date of Most Recent Evaluation	Comments
Load Rating	Complete	10/18/2018	Rating values were updated based on 2018 BHI study
Scour Evaluation			
Level 1	Under Review	7/25/24	
Level 2/3		N/A	Not applicable based on preliminary results of Level 1 scour evaluation.
Plan of Action			
Seismic Vulnerability			
Initial Screening	Complete	4/15/19	
Traffic Volume Count	Complete	7/21-26/2022	ADTT and ADT were updated based on 2022 LANL data
Fracture and Fatigue Evaluations	N/A		No cracks detected, so no evaluation is required per DOE O 437.1

Load Rating

A load rating analysis was completed for the bridge by Bohannan Huston, Inc. (BHI) that was documented in the report titled "Bridge Rating Report for Los Alamos Canyon Bridge over Omega Road, Bridge No. 7622" (dated October 18, 2018). The analysis was conducted based on the Load and Resistance Factor (LRFR) Method resulting in rating factors of 0.35 (inventory) and 0.46 (operating) under HL-93 live loading. In addition, the bridge was evaluated for legal loads, special haul vehicles, and emergency vehicles. Results from the 2018 BHI study showed the bridge had sufficient capacity to carry these loads and thus, load posting of the bridge is not required. In summary, the structure status (open, no restriction) of the bridge is supported by the 2018 BHI study results. No conditions noted during the inspection warrant a change to the load rating.

DOE O 437.1 requires load ratings to be reviewed at least once every 5 years to ensure conditions and assumptions are still valid, or when recommended by inspectors, or when concern for reduced structural capacity is caused by unexpected events. The load rating should be immediately reviewed/updated when the following occurs:

1. Condition rating of structural member is downgraded 4, or element level rating is condition state 4.
2. Section loss of individual member exceeds 5%.

3. Abnormal deformations in the members that the inspector suspects can be from loading.
4. Abnormal change in movement of supports.
5. Change in dead loading of bridge.

Scour Evaluation

A scour evaluation was completed for the bridge by the ES-UI (Engineering Services - Utilities & Infrastructure) group at the Los Alamos National Laboratory (LANL) that was documented in the form "Scour & Waterway Evaluation Field Data - Level 1 Scour Assessment" (issued 2023). A summary of ES-UI's Level 1 scour evaluation is provided below:

- Current waterway under the bridge is a small seasonal stream located at the bottom of the canyon and distant from the bridge supports.
- The 100-year floodplain data show approximately 50 ft of elevation difference between the top of surge and the bridge supports.

The ES-UI group concluded that scour is not a concern for the bridge and should not require scheduled scour inspections and no Level 2 scour evaluation is needed. A review of this evaluation was performed by USACE Philadelphia district personnel. Comments were provided but have not been addressed at the time this report has been written. The reviewer generally agreed with the evaluation, but requested additional documentation be provided in the report. No scour was observed on the substructure as the stream is far away from the supports.

Seismic Evaluation

A seismic evaluation was completed for the bridge by BHI and documented in the report titled "Bridge Seismic Screening Report for Los Alamos Canyon Bridge over Omega Road, Bridge No. 7622" (dated April 2019). The evaluation included two parts, a seismic screening and a capacity-demand analysis, which were performed using the methods prescribed in the Seismic Retrofitting Manual (SRM) for Highway Structures: Part 1- Bridges (FHWA-HRT-06- 032). The bridge was evaluated at two levels of seismic events, a lower-level and upper-level, and the results from BHI's seismic evaluation of the bridge are summarized below:

- Lower-Level Seismic Event (LLSE) -floor beams, spandrel girders, arch ribs, columns, foundations, and anchorage of the bridge were found sufficient. Thus, at the LLSE, the bridge would be fully operational and would pass the SRM performance criteria.

- Upper-Level Seismic Event (ULSE) -floor beams, spandrel girders, arch ribs, and some columns of the bridge were found sufficient; however, the flexural-axial interaction capacity of most of the columns and the moment capacity of the skewback abutment walls were exceeded. Thus, at the ULSE, the bridge is vulnerable to complete or partial collapse and life-safety may not be preserved.

Recommendations were provided by BHI to retrofit the bridge and a call for a strategy meeting with the bridge owner, government agencies, engineering specialists, and other pertinent parties is identified as the next step of the evaluation in accordance with the SRM. This meeting has not occurred but there has been preliminary planning to replace the bridge within 15 years, which per the SRM, would make the bridge service life category ASL 1, which does not require a retrofit to occur. The existing seismic evaluation was reviewed and nothing was observed during the inspection that would make the conditions and assumptions used in the analysis invalid.

Vehicle Traffic Volume

A vehicle traffic volume count for the bridge was conducted by LANL on July 21-26, 2022. The reported value for Average Daily Traffic is 8118 and the reported value for the percentage that is truck traffic is 3%.

A vehicle traffic volume forecast has not been documented for this bridge. Reported Forecasted Average Daily Traffic value is "Unknown". Reported value for the Future Year is "N/ A". Recommend the site complete an estimate prior to the next inspection. This data is being discontinued in the new Specifications for National Bridge Inventory (SNBI), which is the document that will be followed for the next inspection.

Fracture and Fatigue Evaluation

No cracks have been found in the NSTMs and thus, a fracture and fatigue evaluation is not required per DOE O 437.1. Recommend the site determine the need for such an evaluation in accordance with the AASHTO Manual for Bridge Evaluation (Section 7) should cracks be found in the spandrel girders, floor beams/ outriggers, and/or connecting elements (i.e., NSTMs) in a future inspection. The evaluation also applies to the arch column-to-rib connections if cracks are found.

Personnel Qualifications

The qualifications of inspection personnel are summarized for key individuals from the U.S. Army Corps of Engineers' Philadelphia District and LANL in attachment 4.

Attachments

1. Structure Inventory and Appraisal Data Sheet
2. Table of Bridge Element Condition States
3. Deck Delamination Map
4. Personnel Qualifications
5. Photo Log
6. Traffic Management Plan
7. Detailed Map

ATTACHMENT 1 – Structure Inventory and Appraisal Data Sheets

Department of Energy
Structure Inventory and Appraisal Data

NBIS STRUCTURE NUMBER 000000000007622
FIMS SITE NAME NNSA-Los Alamos National Laboratory - NNSA
FIMS PROPERTY NAME Los Alamos Canyon Bridge
UNITS ENGLISH

FIMS PROPERTY NUMBER 43-0434
FIMS REAL PROPERTY UNIQUIE ID (RPUID) 86471
INSPECTION DATE 06/09/24
SCOUR CRITICAL PLAN OF ACTION IN PLACE N/A

IDENTIFICATION

(1)	STATE NAME	New Mexico	CODE	356
(8)	STRUCTURE NUMBER			000000000007622
(5)	INVENTORY ROUTE (ON/UNDER)	ON		131005010
(2)	STATE HIGHWAY DEPARTMENT DISTRICT			05
(3)	COUNTY CODE	028	(4) PLACE CODE	42320
(6)	FEATURES INTERSECTED			Omega Road, West Road
(7)	FACILITY CARRIED			NM501
(9)	LOCATION			JCT. NM501 and Omega Road
(11)	MILE POINT			4.5
(12)	BASE HIGHWAY NETWORK			1
(13)	LRS INVENTORY ROUTE & SUBROUTE NUMBER			0000NM050100
(16)	LATITUDE: 35°52'48"		LONGITUDE: 106°19'19"	
(98)	BORDER BRIDGE STATE CODE	N/A	% SHARE	-
(99)	BORDER BRIDGE STRUCTURE NO			-

STRUCTURE TYPE AND MATERIAL

(43)	STRUCTURE-MATERIAL	Steel	3
	STRUCTURE-TYPE	Arch-Deck	11
(44)	APPROACH-MATERIAL	Steel	3
	APPROACH-TYPE	Stringer/Multi Beam or Girder	02
(45)	NUMBER OF SPANS IN MAIN UNIT		1
(46)	NUMBER OF APPROACH SPANS		6
(107)	DECK-TYPE	Concrete Cast-in-Place	1
(108)	WEARING SURFACE (PROTECTION SYSTREM)		
	A) TYPE OF WEARING SURFACE	Epoxy Overlay	5
	B) TYPE OF MEMBRANCE	None	0
	c) TYPE OF DECK PROTECTION	Unknown	8

AGE AND SERVICE

(27)	YEAR BUILT	1951	(106) YEAR RECONSTRUCTED		1992
(42)	TYPE OF SERVICE	ON	Highway-Pedestrian		5
		UNDER	Highway-Waterway		6
(28)	LANES	ON	4	UNDER	2
(29)	AVERAGE DAILY TRAFFIC (ADT)				8,118
(30)	YEAR OF ADT	2022	(109) TRUCK ADT		3%
(19)	BYPASS, DETOUR LENGTH (Miles)				4.0

GEOMETRIC DATA

(48)	LENGTH OF MAXIMUM SPAN				442.5
(49)	STRUCTURE LENGTH				819.6
(50)	CURB OR SIDEWALK	(LEFT)	8.0	(RIGHT)	0.0
(51)	BRIDGE ROADWAY WIDTH CURB TO CURB				44.0
(52)	DECKWIDTH OUT-TO-OUT				55.5
(32)	APPROACH ROADWAY WIDTH W/ SHOULDERS				44.0
(33)	BRIDGE MEDIAN		No Median		0
(34)	SKEW (DEG)	0	(35) STRUCTURAL FLARED		0
(10)	INVENTORY ROUTE MINIMUM VERTICAL CLEARANCE				25.00
(47)	INVENTORY ROUTE TOTAL HORIZONTAL CLEARANCE				44.00
(53)	MIN VERTICAL CLEARANCE OVER BRIDGE ROADWAY				99.99
(54)	MIN VERTICAL UNDERCLEARANCE			H	17.75
(55)	MIN LATERAL UNDERCLEAR ON RIGHT			N	-
(56)	MIN LATERAL UNDERCLEAR ON LEFT				2.6

NAVIGATION DATA

(38)	NAVIGATION CONTROL	N/A (No Waterway)	N
(111)	PIER PROTECTION		
(39)	NAVIGATION VERTICAL CLEARANCE		0.00
(116)	VERT-LIFT BRIDGE NAV MIN VERT CLEARANCE		N/A
(40)	NAVIGATION HORIZONTAL CLEARANCE		0

STRUCTURE CONDITION AND RISK CLASSIFICATION

	NBI CONDITION RATING		FAIR
	LOWEST CONDITION RATING CODE	SUBSTRUCTURE	5
	ROUTINE INSPECTION INTERVAL RISK CLASSIFICATION		LOW
	UNDERWATER INSPECTION INTERVAL RISK CLASSIFICATION		N/A

CLASSIFICATION

(112)	NBIS BRIDGE LENGTH	YES	Y
(104)	HIGHWAY SYSTEM	Route NOT on the NHS	0
(26)	FUNCTIONAL CLASS	Urban Other Principal Arterial	14
(100)	DEFENSE HIGHWAY	Not a STRAHNET Route	0
(101)	PARALLEL STRUCTURE	NO Parallel Structure	N
(102)	DIRECTION OF TRAFFIC	2-Way traffic	2
(103)	TEMPORARY STRUCTURE		-
(105)	FEDERAL LANDS HWY	Not Applicable	0
(110)	DESIG NATIONAL NETWORK	Route is not part of the national network for trucks	0
(20)	TOLL	On free road	3
(21)	MAINTAINANCE	Department of Energy	79
(22)	OWNER	Department of Energy	79
(37)	HISTORICAL SIGNIFICANCE	Not determinable at this time	4

CONDITION

(58)	DECK	Satisfactory	6
(59)	SUPERSTRUCTURE	Satisfactory	6
(60)	SUBSTRUCTURE	Fair	5
(61)	CHANNEL AND CHANNEL PROTECTION	Excellent	9
(62)	CULVERTS	Not applicable	N

LOAD RATING AND POSTING

(31)	DESIGN LOAD	M18 (H20)	4
(63)	MTHD TO DETERMINE OR	Load and Resistance Factor Rating Factor w-HL93	8
(64)	OPERATING RATING		0.46
(65)	METHOD TO DETERMINE IR	Load and Resistance Factor Rating Factor w-HL93	8
(66)	INVERNTORY RATING		0.35
(70)	BRIDGE POSTING	Posting NOT Required	5
(41)	STRUCTURE STATUS	Open, No Restriction	A

APPRAISAL

(67)	STRUCTURAL EVALUATION	No Entry - Calculated by FHWA	
(68)	DECK GEOMETRY	No Entry - Calculated by FHWA	
(69)	UNDERCLEARANCE, VERTICAL & HORIZONTAL	No Entry - Calculated by FHWA	
(71)	WATER ADEQUACY	Superior to present desirable criteria	9
(72)	APPROACH ROADWAY ALIGHNMENT	Equal to present minimum criteria	6
(36)	TRAFFIC SAFETY FEATURES	Feature: 1=meets std, 0=does not meet or is not provided, N=N/A or not req'd	1111
(113)	SCOUR CRITICAL BRIDGES	Foundation on Dry Land	9

PROPOSED IMPROVEMENTS

(75)	TYPE OF WORK	351
(76)	LENGTH OF STRUCTURE IMPROVEMENT	814.5
(94)	BRIDGE IMPROVEMENT COST	-
(95)	ROADWAY IMPROVEMENT COST	-
(96)	TOTAL PROJEECT COST	-
(97)	YEAR OF IMPROVEMENT COST ESTIMATE	-
(114)	FUTURE ADT	-
(115)	YEAR OF FUTURE ADT	-

INSPECTION

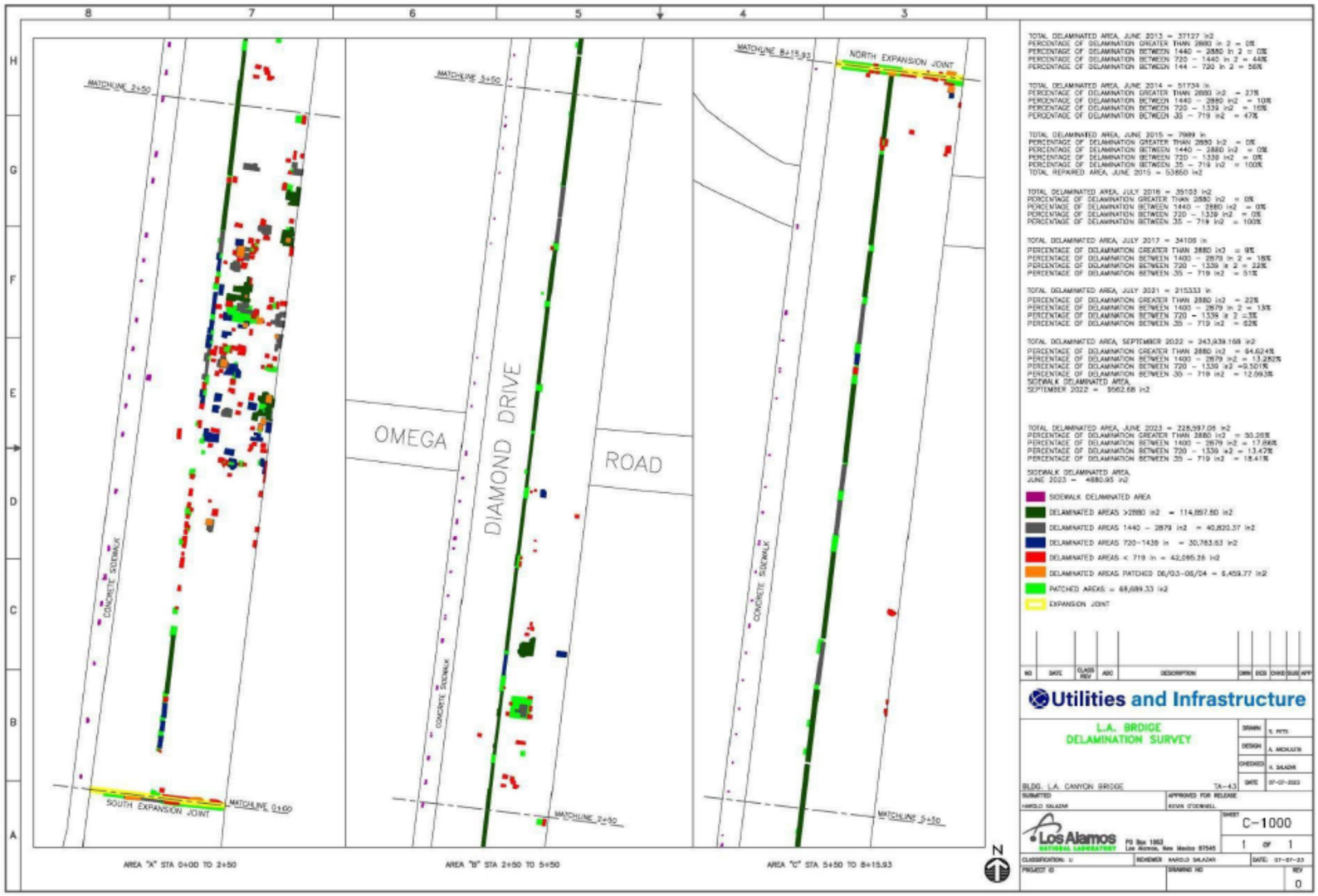
(90)	INSPECTION DATE	0624	(91) INSP FREQUENCY		24
(92)	CRITICAL FEATURE INSPECTION (CFI)			(93) CFI DATES	
	A) FRACTURE CRITIAL DETAIL	Y	24	A)	0624
	B) UNDERWATER INSPECTION	N	N/A	B)	
	C) OTHER SPECIAL INSPECTION	N	N/A	C)	

ATTACHMENT 2 - TABLE OF BRIDGE ELEMENT CONDITION STATES

ELEMENT CONDITION								
Structure Number: 7622 – Omega Bridge at Los Alamos, New Mexico								
Element	Element Description	Unit	Total	CS1	CS2	CS3	CS4	Notes
12	Reinforced Concrete Deck	ft^2	45487	43220	2237	30		
1080	*Delam/Spall/Patch*	ft^2	1694		1579	9		
1090	*Exposed Rebar*	ft^2	3		3			
1120	*Efflo/Rust*	ft^2	21			21		
1130	*Cracking*	ft^2	655		655			
510	Wearing Surface	ft^2	36675	0	22005	14670		
3230	Effectiveness	ft^2	36675		22005	14670		
330	Metal Bridge Rail (E)	ft	837	747		90		East
1000	Corrosion	ft	84			84		
1900/7000	Distortion/Damage	ft	6			6		
515	Steel Protective Coating	ft^2	4703	4463		240		
3440	Effectiveness	ft^2	240			240		
330	Metal Bridge Rail (W)	ft	837			60		West
1000	Corrosion	ft	60			60		
1010	Cracking	ft	0.					
515	Steel Protective Coating	ft^2	2741	2576		165		
3440	Effectiveness	ft^2	165			165		
330	Metal Bridge Rail	ft	820	775		45		Pedestrian
1000	Corrosion	ft	45			45		
515	Steel Protective Coating	ft^2	9454	8887		567		
3440	Effectiveness	ft^2	567			567		
331	Concrete Bridge Rail (E)	ft	820		8	812		East
1080	Delam/Spall/Patch	ft	8		8			
1130	Cracking	ft	812			812		
521	Concrete Protective Coating	ft^2	2964	2786		178		
3230	Effectiveness	ft^2	178			178		
331	Concrete Bridge Rail (W)	ft	820		7	813		West
1080	Delam/Spall/Patch	ft	10		7	3		
1130	Cracking	ft	810			810		
521	Concrete Protective Coating	ft^2	2964	2786		178		
3230	Effectiveness	ft^2	178			178		
303	Assembly Joint Seal (N)	ft	56	38	6	12		North
2310	Leakage	ft	0					
2330	Seal Damage	ft	0					
2360	Adj. Deck Header	ft	18		6	12		
303	Assembly Joint Seal (S)	ft	56	35	6	15		South
2310	Leakage	ft	0					
2330	Seal Damage	ft	0					
2360	Adj. Deck Header	ft	21		6	15		
141	Steel Arch	ft	845	365	404	76		
1000	Corrosion	ft	476		400	76		
1900/7000	Distortion/Damage	ft	4		4			
515	Steel Protective Coating	ft^2	21754	14674	2890	4190		
3440	Effectiveness	ft^2	7080		2890	4190		
107	Steel Open Girder- Spandrel	ft	1629	1498	102	29		
1000	Corrosion	ft	115		90	25		
1020	Connection	ft	14		10	4		
1900/7000	Distortion/Damage	ft	2		2			
515	Steel Protective Coating	ft^2	45136	44820	256		60	
3410	Chalking	ft^2	5		5			
3420	Peeling	ft^2	291		251		40	
3440	Effectiveness	ft^2	20				20	

Element	Element Description	Unit	Total	CS1	CS2	CS3	CS4	Notes
152	Steel Floor Beams	ft	1442	1133	244	65		
1000	Corrosion	ft	270		205	65		
1020	Connection	ft	21		21			
1900/7000	Distortion/Damage	ft	18		18			
515	Steel Protective Coating	ft^2	14634	14424	210			
3420	Peeling	ft^2	210		210			
113	Steel Stringers	ft	4887	4629	246	12		
1000	Corrosion	ft	255		243	12		
1900/7000	Distortion/Damage	ft	3		3			
515	Steel Protective Coating	ft^2	27256	26609	617	30		
3420	Peeling	ft^2	617		617			
3440	Effectiveness	ft^2	30			30		
311	Moveable Bearings	Each	8		2	6		
1000	Corrosion	Each	8		2	6		
313	Fixed Bearings	Each	8	4	2	2		
1000	Corrosion	Each	8	4	2	2		
316	Other Bearings	ft	4		4			
1000	Corrosion	ft	4		4			
215	Reinforced Concrete Abutment	ft	111	34	15	62		
1080	Delam/Spall/Patch	ft	10			10		
1090	Exposed Rebar	ft	4			4		
1120	Efflo/Rust	ft	45		7	38		
1190	Abrasion/Wear	ft	18		8	10		
521	Concrete Protective Coating	ft^2	334		169	90	75	
3520	Peeling/Bubbling	ft^2	334		169	90	75	
202	Steel Columns	Each	12		12			
1000	Corrosion	Each	12		12			
515	Steel Protective Coating	ft^2	6623	6463	160			
3520	Peeling/Bubbling	ft^2	160		160			
205	Concrete Columns	Each	12	1	9	2		
1080	Delam/Spall/Patch	Each	5		4	1		
1130	Cracking	Each	7	1	5	1		

ATTACHMENT 3 - DECK DELAMINATION MAP



ATTACHMENT 4- PERSONNEL QUALIFICATIONS SUMMARY

Name	Professional Registration (State, Year)	Comprehensive Bridge Inspection Course (Year)	Bridge Inspection Refresher Course (Year)	Other Bridge Inspection Training (Year)	Degree in Abet Accredited College or University (Degree/Year)	SPRAT (Year, Level)	Qualification Inspection Experience (Number of Years)
Sabah Alsabbagh	Maryland, 2023	2016	2020	NSTM/2017	Bachelors of Science in Civil Engineering/1994	N/A	8
Matthew Sosna	New Jersey, 2013	2009	2019	2023	Masters of Science in Civil Engineering/2018	N/A	15
Carl Leunig	Maryland, 2014	2010	2022	N/A	Bachelors of Science in Civil Engineering/2009	SPRAT Level 3,	15
Joseph Gonglik	Virginia	2017	2022	NSTM/2024	Bachelors of Science in Civil Engineering/2005	SPRAT Level 1	7
Evan Amezquita	N/A	2022	N/A	N/A	Bachelors of Science in Civil Engineering/2021	SPRAT Level 1, 2023	4
Liam Ryan	N/A	2024	N/A	N/A	Masters of Science in Civil Engineering/2021	SPRAT Level 1, 2024	1
Nestor Delgado	Puerto Rico 2004, Florida 2006	2011	2023	NSTM/2024	Masters of Science in Civil Engineering/2002	SPRAT Level 1, 2011	13